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Ohsawa et al.

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[54] **AUTOFOCUS CAMERA**

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[73] Assignee: **Nikon Corporation**, Tokyo, Japan

[21] Appl. No.: **453,462**

[22] Filed: **May 30, 1995**

Related U.S. Application Data

[63] Continuation of Ser. No. 357,092, Dec. 15, 1994, abandoned, which is a continuation of Ser. No. 185,167, Jan. 24, 1994, abandoned, which is a continuation of Ser. No. 786,606, Nov. 1, 1991, abandoned.

[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**[6] **G03B 13/36**

[52] **U.S. Cl.** **354/402**; 354/408

[58] **Field of Search** 354/402–409

[56] **References Cited**

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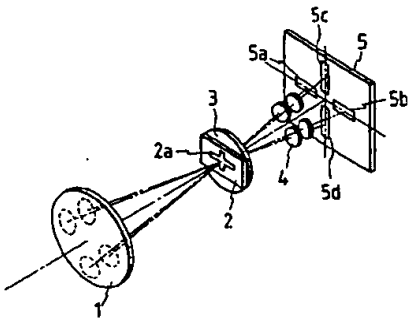
Primary Examiner—Russell E. Adams

Attorney, Agent, or Firm—Shapiro and Shapiro

[57] **ABSTRACT**

An autofocus camera conducts a focus detection operation with one of differently directed sets of photoelectric conversion elements which is given priority according to the detected attitude of the camera. If focusing cannot be effected using the elements given priority, a focus detection operation is automatically conducted with the other elements. Also provided is a camera having a first mode of operation in which focusing detecting operations are conducted which collectively utilize outputs of all of the elements of differently directed sets of photoelectric conversion elements when a first camera attitude is detected, and a second mode of operation in which focusing detecting operations are conducted which collectively disregard the output of at least one conversion element when a second camera attitude is detected.

11 Claims, 5 Drawing Sheets



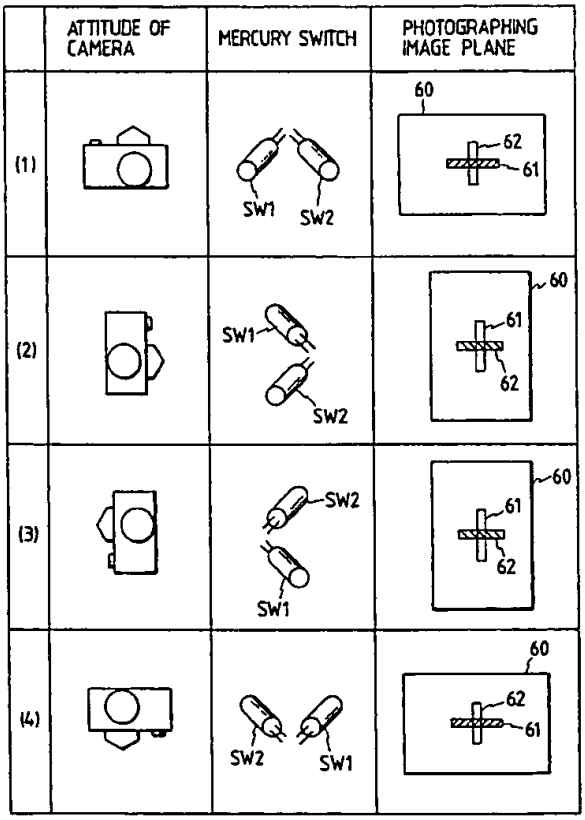


FIG. 1

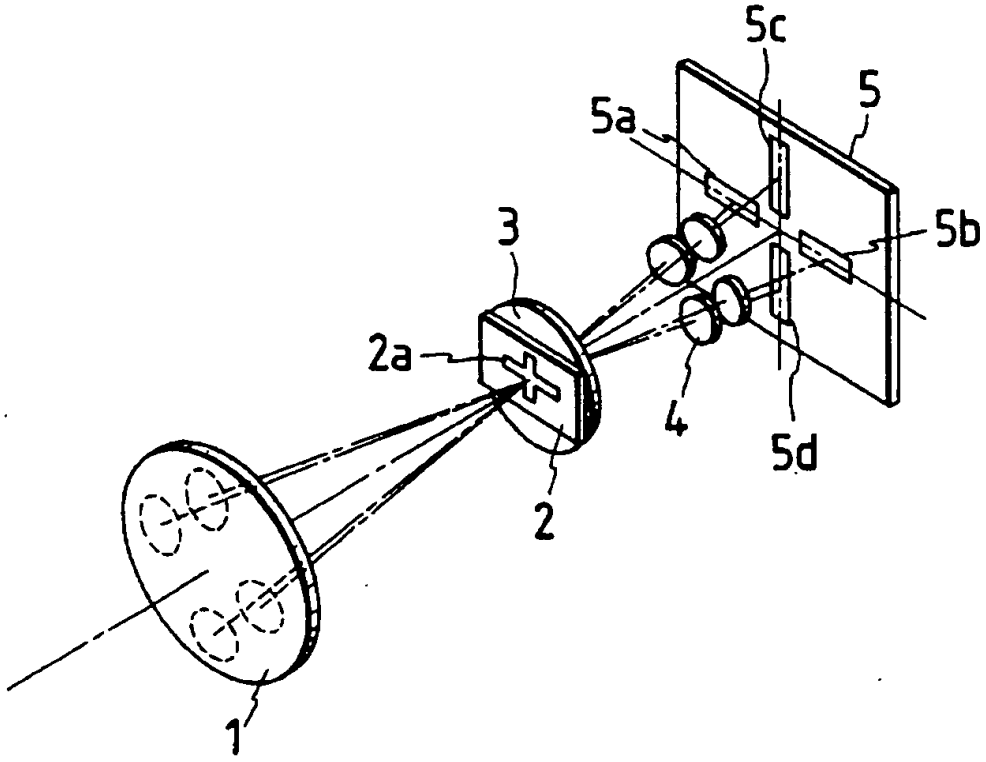


FIG. 2

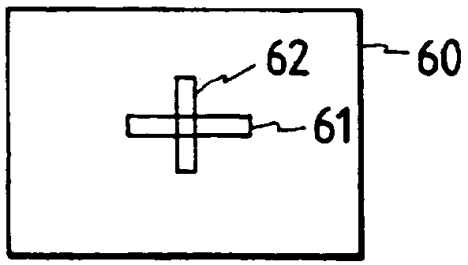


FIG. 3

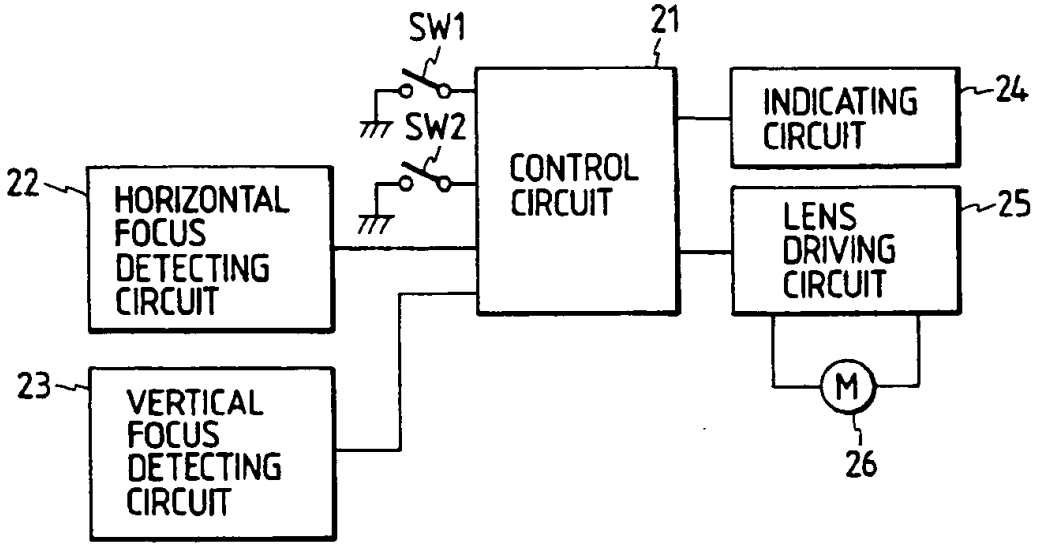


FIG. 6

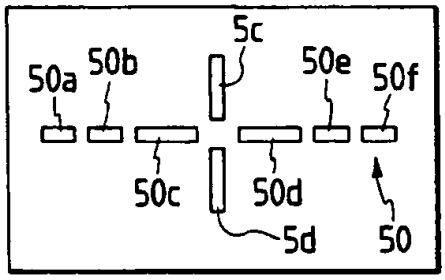


FIG. 7

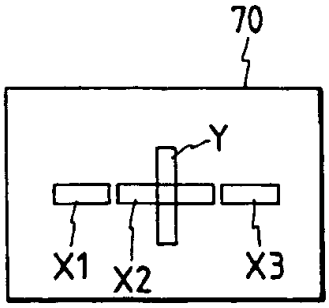


FIG. 9

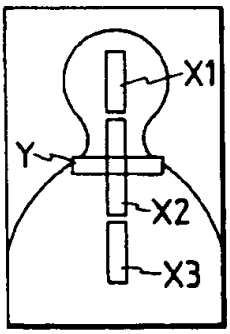


FIG. 4

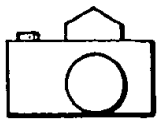
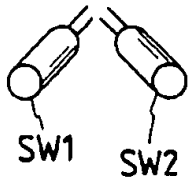
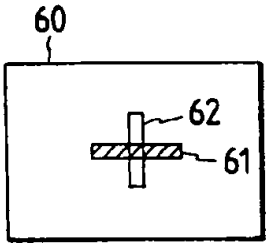
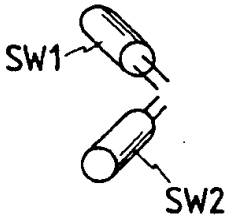
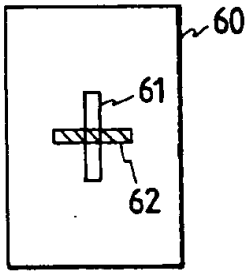
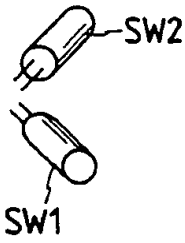
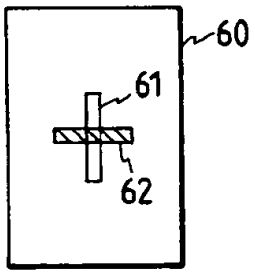
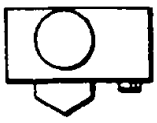
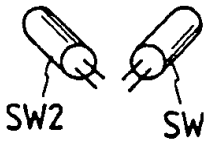
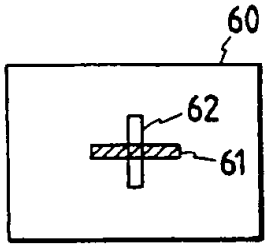
	ATTITUDE OF CAMERA	MERCURY SWITCH	PHOTOGRAPHING IMAGE PLANE
(1)			
(2)			
(3)			
(4)			

FIG. 5

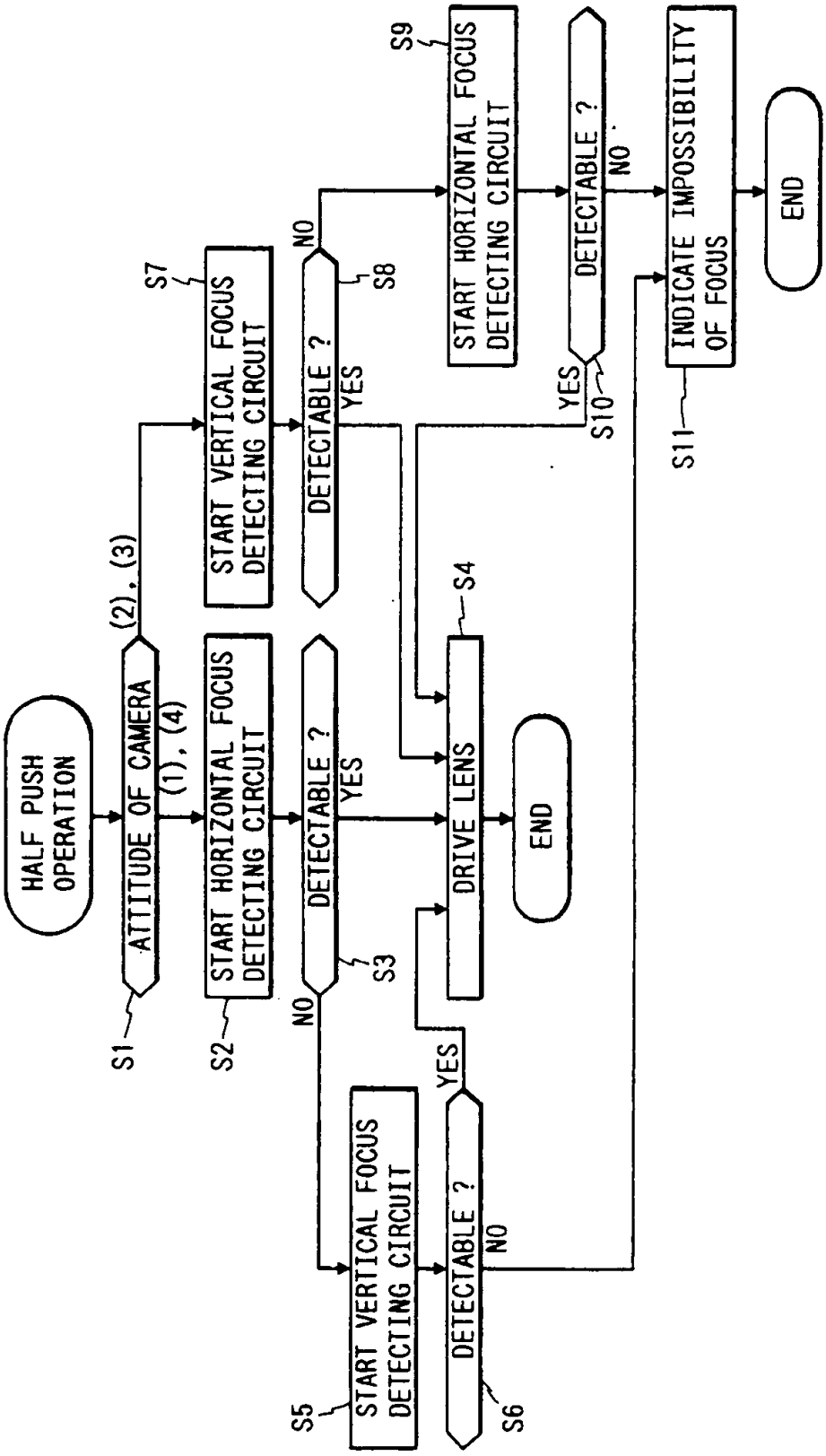
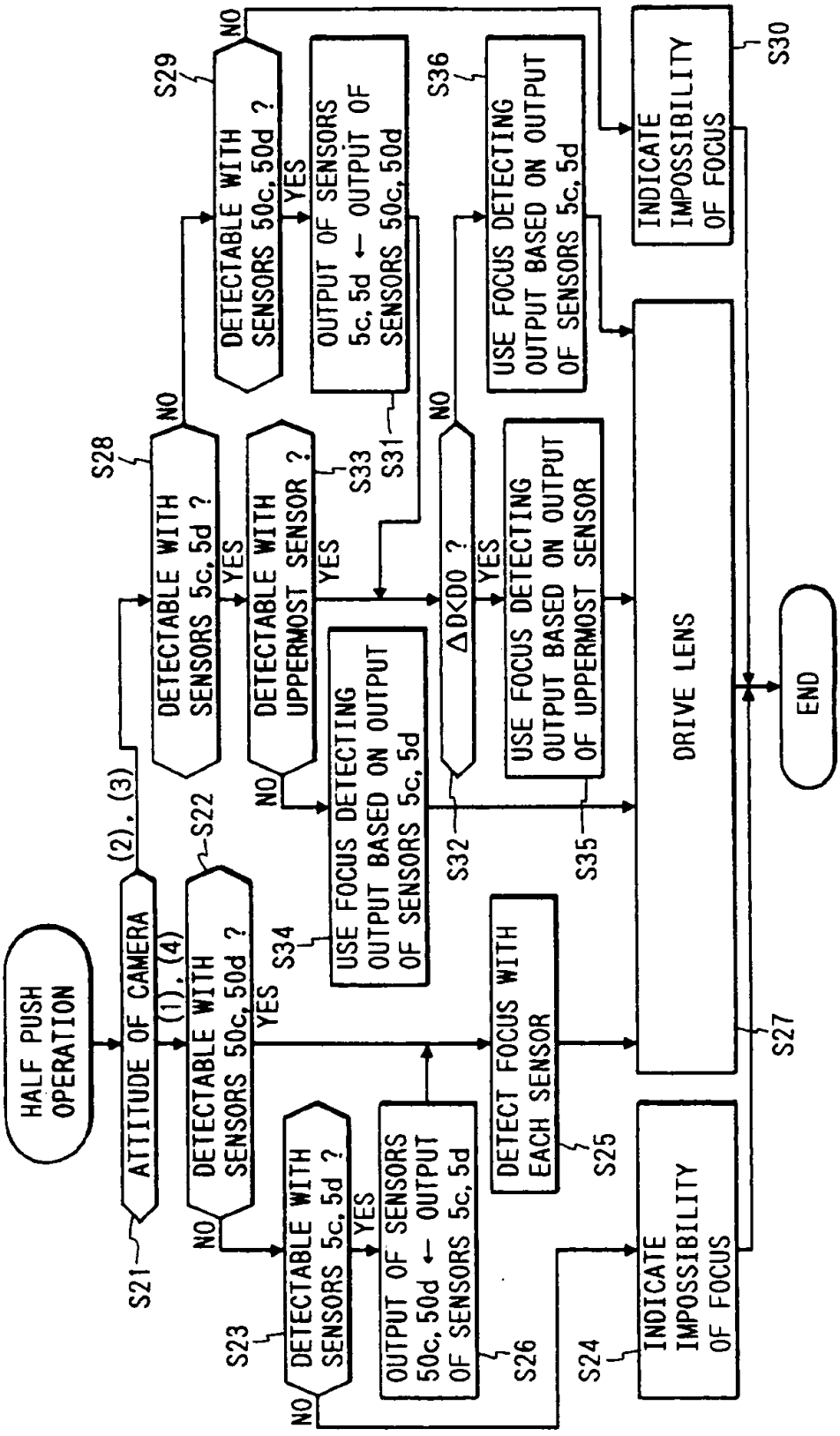

HALF PUSH OPERATION
ATTITUDE OF CAMERA
(1), (4)
(2), (3)
S1
START HORIZONTAL FOCUS DETECTING CIRCUIT
S2
DETECTABLE ?
YES
NO
S3
DRIVE LENS
S4
END
START VERTICAL FOCUS DETECTING CIRCUIT
S5
DETECTABLE ?
YES
NO
S6
START VERTICAL FOCUS DETECTING CIRCUIT
S7
DETECTABLE ?
NO
YES
S8
START HORIZONTAL FOCUS DETECTING CIRCUIT
S9
DETECTABLE ?
NO
YES
S10
INDICATE IMPOSSIBILITY OF FOCUS
S11
END

FIG. 8


HALF PUSH OPERATION
ATTITUDE OF CAMERA
(1), (4)
(2), (3)
S21
DETECTABLE WITH SENSORS 50c, 50d ?
S22
YES
NO
DETECTABLE WITH SENSORS 5c, 5d ?
S23
YES
NO
OUTPUT OF SENSORS 50c, 50d ← OUTPUT OF SENSORS 5c, 5d
S26
DETECT FOCUS WITH EACH SENSOR
S25
INDICATE IMPOSSIBILITY OF FOCUS
S24
DETECTABLE WITH SENSORS 5c, 5d ?
S28
YES
NO
DETECTABLE WITH UPPERMOST SENSOR ?
S33
YES
NO
USE FOCUS DETECTING OUTPUT BASED ON OUTPUT OF SENSORS 5c, 5d
S34
ΔD<DO ?
S32
YES
NO
USE FOCUS DETECTING OUTPUT BASED ON OUTPUT OF UPPERMOST SENSOR
S35
DETECTABLE WITH SENSORS 50c, 50d ?
S29
YES
NO
OUTPUT OF SENSORS 5c, 5d ← OUTPUT OF SENSORS 50c, 50d
S31
USE FOCUS DETECTING OUTPUT BASED ON OUTPUT OF SENSORS 5c, 5d
S36
INDICATE IMPOSSIBILITY OF FOCUS
S30
DRIVE LENS
S27
END

AUTOFOCUS CAMERA

This is a continuation of application Ser. No. 08/357,092 filed Dec. 15, 1994, which is a continuation of application Ser. No. 08/185,167 filed Jan. 24, 1994, which is a continuation of application Ser. No. 07/786,606 filed Nov. 1, 1991, all now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an autofocus camera in which focus is detected by either horizontal or vertical photoelectric conversion elements which are given priority.

2. Related Background Art

A known example of such autofocus cameras is disclosed in Japanese Patent Application Laid-open No. 62-95511. This autofocus camera is described below with reference to FIG. 1.

In FIG. 1, the subject light passed through a photographic lens **1** is passed through a cross-shaped opening **2***a* of a field mask **2** disposed at art expected focal plane of the photographic lens **1** and then through a capacitor lens **3** and four re-projecting lenses **4** to reach an image sensor **5**. Two horizontal line image sensors (photoelectric conversion elements) **5***a*, **5***b* which are extended in the horizontal direction of a camera, and two vertical line image sensors (photoelectric conversion elements) **5***c*, **5***d* which are extended in the vertical direction of the camera are disposed on the image sensor **5**. The light passed through the horizontal portion of the field mask opening **2***a* is received by the line image sensors **5***a*, **5***b* through the corresponding reprojecting lenses **4**, and the light passed through the vertical portion of the opening **2***a* is received by the line image sensors **5***c*, **5***d* through the corresponding reprojecting lenses **4**.

The horizontal portion of the opening **2***a* corresponds to a horizontal detecting region **61** which is horizontally extended on the photographing image plane **60** shown in FIG. **2**, and the vertical portion of the opening **2***a* corresponds to a vertical detecting region **62** which is vertically extended. Thus, the subject light from the horizontal detecting region **61** is received by the horizontal line image sensors **5***a*, **5***b*, and the subject light from the vertical detecting region **62** is received by the vertical line image sensors **5***c*, **5***d*.

Each of the line image sensors **5***a*, **5***b*, **5***c*, **5***d* photoelectrically converts the subject light and provides an input signal to a focus detecting circuit (not shown). The focus detecting circuit calculates defocusing amount and direction from the input signal in order to drive the photographic lens **1** to the focusing position. The photographic lens **1** is focused on the basis of the defocusing amount and direction.

The advantages of the above arrangement comprising the horizontal and vertical line image sensors are described below.

In such a focus detection system, when a subject is parallel with the direction in which two line image sensors, i.e., a detecting region in the photographing image plane, are extended, since the output of the two line image sensors is flat without contrast, the defocusing amount and direction cannot be calculated, and the focus cannot be thus detected. The line image sensors are thus disposed in both the horizontal and vertical directions so that priority is given to the line image sensors in one (for example, the horizontal direction) of the two directions for detecting focus on the basis of the output thereof, and when the focus cannot be detected, the focus is detected on the basis of the output from the line image sensors in the other direction (vertical direction). This permits the focus to be surely detected regardless of the direction in which the subject is extended.

In such conventional autofocus cameras, since the line image sensors given priority are fixed, the direction of the sensors given priority, i.e., the direction of the detecting region given priority, with respect to the subject when the camera is in the horizontal attitude is different from that in the vertical attitude. For example, when priority is given to the horizontal line image sensors (horizontal detecting region **61**), the detecting region **61** given priority is extended in the horizontal direction of the subject when the camera is in the horizontal attitude, while the detecting region **61** is extended in the vertical direction of the subject when the camera is in the vertical attitude.

It will be appreciated, of course, that when focus cannot be detected by using the line image sensors given priority, the time for focusing becomes longer. Thus, when the direction of the detecting region given priority with respect to the subject changes with changes in the attitude of the camera, as described above, there is the problem that the time for focusing the photographic lens when the subject is in the vertical attitude is different from that when the same subject is in the horizontal attitude.

SUMMARY OF THE INVENTION

In accordance with a first of its principal aspects, the present invention provides an autofocus camera which conducts a focus detection operation with one of differently directed sets of photoelectric conversion elements which is given priority according to the detected attitude of the camera. If focusing cannot be effected using the elements given priority, a focus detection operation is automatically conducted with the other elements.

In accordance with another of its principal aspects, the invention provides an auto focus camera in which each of differently directed first and second photoelectric conversion means includes a plurality of light-receiving elements. The camera has a first mode of operation in which focus detecting operations are conducted which collectively utilize outputs of all of the light-receiving elements when a first camera atitude is detected, and a second mode of operation in which focus detecting operations are conducted which collectively disregard the output of at least one such element when a second camera attitude is detected.

The various features and advantages of the present invention will be more fully appreciated from the following description of the embodiments illustrated in the accompanying drawings.

Although the present invention is described with reference to embodiments shown in the drawings, the invention is not limited to these embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view showing a focus detecting optical system;

FIG. **2** is a drawing showing focus detecting regions;

FIGS. **3** to **5** show an embodiment of the present invention, in which FIG. **3** is a block diagram showing the control system of an autofocus camera according to the invention, FIG. **4** is a drawing showing the relation of the attitude of a camera to the state of a mercury switch and the direction of

a photographing image plane, and FIG. 5 is a flow chart showing the processing procedure;

FIGS. 6 to 9 show another embodiment of the invention, in which:

FIG. 6 is a drawing showing the arrangement of line image sensors;

FIG. 7 is a drawing showing focus detecting regions on a photographing image plane;

FIG. 8 is a flow chart showing the processing procedure; and

FIG. 9 is a drawing showing focus detecting regions on a photographing image plane when a person is photographed by a camera in the vertical attitude.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

An embodiment in which the present invention is applied to an autofocus camera having the focus detecting optical system shown in FIG. 1 is described below with reference to FIGS. 3 to 5.

FIG. 3 is a block diagram showing the control system of an autofocus camera according to the present invention. A horizontal focus detecting circuit **22** and a vertical focus detecting circuit **23** are connected to a control circuit **21**. The horizontal focus detecting circuit **22** performs a known focus detecting operation for calculating the defocusing amount and defocusing direction using the photoelectric conversion output from the horizontal line image sensors *5a*, *5b* shown in FIG. 1, both of which receives the subject light from the horizontal detecting regions **61** on the photographing image plane **60**, so as to focus the photographing lens **1** on the subject. Similarly, the vertical focus detecting circuit **23** performs the focus detecting operation for calculating the defocusing amount and defocusing direction using the output from the vertical line image sensors *5c*, *5d*, both of which receive the subject light from the vertical detecting region **62** on the photographing image plane **60**.

In this embodiment, the line image sensors corresponding to the focus detecting region extended in the horizontal direction of the subject are given priority for detecting the focus because the subject is generally frequently extended in the vertical direction rather than in the horizontal direction.

A indicating circuit **24**, a lens driving circuit **25** and two mercury switches **SW1**, **SW2** are also connected to the control circuit **21**. A focusing motor **26** is connected to the lens driving circuit **25** so as to be driven in response to the command from the control circuit for focusing the photographing lens **1**. The indicating circuit **24** indicates the impossibility of focusing by using a display (not shown) provided, for example, in a finder in response to the command from the control circuit **21**.

The mercury switches **SW1**, **SW2** are arranged substantially in the form of an invented V when the camera is in the normal horizontal attitude (in which the upper side of the camera body faces upward), as shown by **(1)** in FIG. 4. The on/off state of each of the mercury switches SW1, SW2 is changed as the mercury is gravitationally moved according to the attitude of the camera, as shown in FIG. 4. Namely, when the camera is in the attitude (horizontal attitude) shown by **(1)** in FIG. 4, both switches SW1, SW2 are turned off, and when the camera is in the attitude (vertical attitude) shown by **(2)**, the switch SW1 is turned on, while the switch SW2 is turned off. In the attitude (vertical attitude) shown by **(3)**, the switch SW1 is turned off, while the switch SW2 is turned on. In the attitude (horizontal attitude) shown by **(4)**, both switches SW1, SW2 are turned on.

The procedure of the focusing control by the control circuit **21** is described below on the basis of the flow chart shown in FIG. 5.

For example, when a release button (not shown) is half pushed, the program shown in FIG. 5 is started. In Step S1, the attitude of the camera is first detected from the states of the mercury switches SW1, SW2. If both switches SW1, SW2 are turned on or off, it is decided that the camera is in the horizontal attitude, i.e., the attitude shown by (1) or (4) in FIG. 4, and the flow moves to Step S2 in which the horizontal focus detecting circuit **22** is started. The horizontal focus detecting circuit **22** reads the output of the horizontal line image sensors *5a*, *5b*, determines the defocusing amount and defocusing direction of the photographic lens by a known focus detecting operation on the basis of the output of the horizontal line image sensors *5a*, *5b* and inputs the defocusing amount and direction to the control circuit **21**. When the defocusing amount and defocusing direction cannot be calculated because horizontal contrast is absent in the subject, a signal indicating the impossibility of focusing is input to the control circuit **21**.

In Step S3, the control circuit **21** makes a decision on the basis of the output from the horizontal focus detecting circuit **22** whether or not the focus can be detected. If it is decided that the focus can be detected, in Step S4, a lens driving signal corresponding to the defocusing amount and direction is output to the lens driving circuit **25** so as to drive the photographic lens **1** toward the focusing position by using the motor **26**. On the other hand, if it is decided in Step S3 that the focus cannot be detected, the flow moves to Step S5 in which the vertical focus detecting circuit **23** is started.

The vertical focus detecting circuit **23** detects the focus on the basis of the output from the vertical line image sensors *5c*, *5d* and inputs the defocusing amount and direction or the signal indicating the impossibility of focusing to the control circuit **21** in the same way as that described above. In Step S6, the control circuit **21** makes a decision on the basis of the input signal whether or not the focus can be detected. If it is decided that the focus can be detected, the flow moves to Step S4, while if it is decided that the focus cannot be detected, the flow moves to Step S11. In Step S11, a display signal is sent to the indicating circuit **24** so that the impossibility of focusing is indicated by the display (not shown),

On the other hand, in Step S1, if one of the two switches SW1, SW2 is turned on, and the other is turned off, it is decided that the camera is in the vertical attitude, i.e., the attitude shown by (2) or (3), and the flow moves to Step S7 in which the vertical focus detecting circuit **23** is started. In Step S8, a decision is made on the basis of the output from the vertical focus detecting circuit **23** whether or not the focus can be detected. If it is decided that the focus can be detected, in Step S4, the lens driving signal corresponding to the defocusing amount and direction, both of which are input from the vertical focus driving circuit **23**, is output to the lens driving circuit **25** so as to drive the photographic lens **1** toward the focusing position by using the motor **26**.

If it is decided in Step S8 that the focus cannot be detected, the flow moves to Step S9 in which the horizontal focus detecting circuit **22** is started. In Step S10, a decision is made on the basis of the signal from the horizontal focus detecting circuit **22** as to whether or not the focus can be detected. If it is decided that the focus can be detected, the flow moves to Step S4, while if it is decided that the focus cannot be detected, the flow moves to Step S11.

In detection of the focus according to the abovedescribed procedure, priority is given to the horizontal lime image sensors 5*a*, 5*b* when the camera is in the horizontal attitude, while priority is given to the vertical line image sensors 5*c*, 5*d* when the camera is in the vertical attitude. The shaded region in the photographing image plane **60** shown in FIG. **4** shows a detecting region corresponding to the line image sensors having priority. As shown in FIG. **4**, the line image sensors given priority, i.e., the detecting region given priority, are constantly in the horizontal direction with respect to the subject regardless of the attitude of the camera. In the case of a vertical subject (ordinary case), the time required for focusing the photographic lens **1** can be minimized regardless of the attitude of the camera.

In this embodiment, the horizontal line image sensors 5*a*, 5*b* comprise horizontal photoelectric conversion elements, the vertical line image sensors 5*c*, 5*d* comprise vertical photoelectric conversion elements, the control circuit **21** and the horizontal and vertical focus detecting circuits **22**, **23** comprise focus detecting devices, the lens driving circuit **25** and the motor **26** comprise lens driving devices and the mercury switches **SW1**, **SW2** comprise attitude detecting devices, respectively.

FIGS. **6** to **9** show another embodiment of the invention.

FIG. **6** shows the arrangement of line image sensors. As shown in the drawing, in this embodiment, a line image sensor **50** is divided into partial sensors **50***a*, **50***b*, **50***c*, **50***d*, **50***e*, **50***f*. The partial sensors **50***a*, **50***b* receive the subject light from the detecting region X1 in the photographing image plane **70** shown in FIG. **7**. The partial sensors **50***c*, **50***d* receive the subject light from the detecting region X2, and the partial sensors **50***e*, **50***f* receive the subject light from the detecting region X3. The horizontal focus detecting circuit **22** calculates the defocusing amount and direction on the basis of the output from the partial sensors. The vertical focus detecting circuit **23** calculates the defocusing amount and direction on the basis of the output from the vertical line image sensors 5*c*, 5*d*, like the above-described embodiment.

FIG. **8** shows a flow chart for focusing control in this embodiment.

In Step **S21**, the attitude of the camera is detected according to the states of the mercury switches **SW1**, **SW2** in the same way as the first embodiment. If the camera is in the horizontal attitude (shown by (1) or (4) in FIG. **4**), the horizontal focus detecting circuit **22** is started so as to determine the defocusing amount and direction on the basis of the output from the central partial sensors **50***c*, **50***d* (corresponding to the detecting region **X2**). Namely, the detecting circuit **22** detects the focus. In Step **S22**, a decision is made on the basis of the output from the partial sensors **50***c*, **50***d* as to whether or not the focus can be detected. If it is decided that the focus cannot be detected, the focus is detected on the basis of the output from the vertical line image sensors 5*c*, 5*d* (corresponding to the detecting region Y). If it is decided in Step **S23** that the focus cannot be detected, the impossibility of focusing is indicated in Step **S24** in the same way as that described above.

In the case of Yes in Step **S22**, the flow moves to Step **S25**. In the case of Yes in Step **S23**, the output from the image sensors 5*c*, 5*d* is handled as the output from the partial sensors **50***c*, **50***d*, and the flow moves to Step **S25**. In Step **S25**, the focus is detected on the basis of the output from the partial sensors **50***a*, **50***b* (corresponding to the detecting region X1), the partial sensors **50***c*, **50***d* (corresponding to the detecting region X2 or Y) and the partial sensors **50***e*, **50***f* (corresponding to the detecting region X3). The detection may be controlled by, for example, the method disclosed in Japanese Patent Application Laid-open No. 63-18314. The details of this control method are not described below because the method per se is not part of the present invention. The processing then goes to Step **S27** in which the photographic lens **1** is focused on the basis of the results of focus detection performed in Step **S25**.

On the other hand, if it is decided in Step **S21** that the camera is in the vertical attitude, i.e., the attitude shown by (2) or (3) in FIG. **4**, the focus is detected on the basis of the output from the vertical line image sensors 5*c*, 5*d*. If it is decided in Step **S28** that the focus cannot be detected, the focus is detected on the basis of the output from the partial sensors **50***c*, **50***d*, and the flow moves to Step **S29**. If it is decided in Step **S29** that the focus cannot be detected, the impossibility of focusing is indicated in Step **S30**, and the processing is finished. If it is decided in Step **S29** that the focus can be detected, the output from the partial sensors **50***c*, **50***d* is handled as the output from the vertical line image sensors 5*c*, 5*d* in Step **S31**, and the flow then moves to Step **S32**.

If it is decided in Step **S28** that the focus can be detected, a decision is made in Step **S33** as to whether or not the focus can be detected with the uppermost partial sensors. When the camera is in the attitude (2), the uppermost partial sensors are the partial sensors **50***a*, **50***b* (corresponding to the uppermost detecting region X1). When the camera is in the attitude (3), the uppermost partial sensors are the partial sensors **50***e*, **50***f* (corresponding to the uppermost detecting region X3). In the case of No in Step **S33**, the focus detecting output (defocusing amount and direction) based on the output from the vertical line image sensors 5*c*, 5*d* is used in Step **S34**. The flow then moves to Step **S27** for focusing on the basis of that output.

In the case of Yes in Step **S33**, the flow moves to Step **S32** for determining the difference ΔD (ΔD=|Dy−Dup|) between the focus detecting output Dy based on the output from the vertical line image sensors 5*c*, 5*d* and the focus detecting output Dup from the uppermost partial sensors. If the difference ΔD is less than a predetermined value DO, the focus detecting output based on the output from the uppermost partial sensors is employed in Step **S35**. If the difference ΔD is over the predetermined value DO, the focus detecting output based on the output from the vertical line image sensors 5*c*, 5*d* (in this case, extended in the horizontal direction of the subject) is employed in Step **S36**, and the flow then moves to Step **S27**.

In the detection of the focus according to the above-described procedure, priority is given to the horizontal line image sensor **50** when the camera is in the horizontal attitude, and priority is given to the vertical line image sensors 5*c*, 5*d* when the camera is in the vertical attitude in the same way as in the first embodiment. The same effects as those obtained in the first embodiment can thus be obtained. Particularly, in this embodiment, when the camera is in the vertical attitude, i.e., the attitude in which the horizontal focus detecting regions X1, X2, X3 are vertically extended, the vertical line image sensors 5*c*, 5*d* and the uppermost partial sensors have priority for detecting the focus.

When a person is photographed, for example, by the camera in the vertical attitude, as shown in FIG. **9**, the uppermost detecting region (X1 in the case shown in FIG. **9**) of the horizontal detecting regions X1, X2, X3 is frequently placed at the position of the face of the subject. The photographic lens can thus be focused on the face of the

subject by the uppermost partial sensors given priority. However, when two persons form a line, the uppermost detecting region is placed in the background, and there is thus the possibility of producing a so-called middle blank. The difference ΔD between the focus detecting output Dup based of the output from the uppermost partial sensors and the focus detecting output Dy based on the output from the vertical line image sensors *5c*, *5d* is thus determined. When the difference ΔD is less than the predetermined value DO, it is decided that the main subject is placed in the uppermost detecting region, and the focus detecting output based on the output from the uppermost partial sensors is employed. When the difference ΔD is greater than the predetermined value DO, it is decided that the main subject is not placed in the uppermost detecting region, and the focus detecting output based on the output from the vertical line image sensors *5c*, *5d* is employed for driving the lens. It is therefore possible to surely focus on the main subject.

Although, in this embodiment, the horizontal line image sensor is divided into a plurality portions, the vertical line image sensor may be divided. Also, while the above embodiments concern the case in which the focus is detected on the basis of the subject light passed through the photographic lens, the focus may be detected by receiving the subject light without passing through the photographic lens. In addition, the horizontal and vertical focus detecting regions need not be arranged in a cross form, but may be separated from each other. Further, although the above embodiments concern the case where priority is given to the line image sensors corresponding to the focus detecting region extended in the horizontal direction of the subject, priority may be given to the line image sensors corresponding to the focus detecting region extended in the vertical direction of the subject. Of course, attitude detecting devices for the camera are not limited to the mercury switches SW1, SW2.

In the present invention, in a camera having horizontal and vertical focus detecting photoelectric conversion elements, the direction of the photoelectric conversion elements given priority, i.e., the detecting region given priority, with respect to the subject remains unchanged regardless of the attitude of the camera. It is thus possible to effect focusing of the photographic lens without undue delay even if the attitude with respect to the subject is changed.

What is claimed is:

1. An autofocus camera comprising:

a first photoelectric conversion unit to receive subject light from a detecting region extended in one direction of a photographic image plane and to perform photoelectric conversion;

a second photoelectric conversion unit to receive subject light from a detecting region extended in a direction different from said one direction of said photographic image plane and to perform photoelectric conversion;

an attitude detector to detect attitude of the camera;

a focus detector which selects one of said first and second photoelectric conversion units corresponding to a predetermined priority direction in the detected attitude of the camera and which conducts a focus detection operation using the selected photoelectric conversion unit, said focus detector discriminating based on a result of said focus detection operation whether focus can be detected using the selected photoelectric conversion unit, and, if it is discriminated that focus cannot be detected using the selected photoelectric conversion unit, conducting a focus detection operation using the other of said first and second photoelectric conversion units, said focus detector further providing a focus detection result to be used for focus control; and

a lens driving unit to drive and focus a photographic lens in accordance with the focus detection result from said focus detector.

2. An autofocus camera according to claim 1, wherein said first photoelectric conversion unit is horizontally oriented and said second photoelectric conversion unit is vertically oriented when the camera is in a horizontal attitude.

3. An autofocus camera according to claim 2, wherein said first photoelectric conversion unit is divided into a plurality of detection regions, said predetermined priority direction is horizontal, and said focus detector has an operating mode in which, when the camera attitude is such that said first photoelectric conversion unit is vertically oriented, said focus detector conducts a focus detection operation with the uppermost of said plurality of detection regions and controls said lens driving unit giving priority to said uppermost region over said second photoelectric conversion unit.

4. An autofocus camera according to claim 3, wherein, in said operating mode, said focus detector calculates a difference between a focus detection output obtained using said second photoelectric conversion unit and a focus detection output obtained using said uppermost detection region, and controls said lens driving unit in accordance with the focus detection output corresponding to said uppermost detection region when said difference is less than a predetermined value and in accordance with the focus detection output of said second photoelectric conversion unit when said difference is greater than said predetermined value.

5. An autofocus camera according to claim 1, wherein said focus detector outputs a focus impossibility indication when focus cannot be detected using said first photoelectric conversion unit and cannot be detected using said second photoelectric conversion unit.

6. An autofocus camera comprising:

a first photoelectric conversion unit including a plurality of elements to receive subject light from detecting regions which extend along one direction of a photographing image plane and to perform photoelectric conversion;

a second photoelectric conversion unit to receive subject light from at least one detecting region extending along a direction different from said one direction of said photographing image plane and to perform photoelectric conversion;

an attitude detector to detect attitude of the camera;

a focus detector having a first mode of operation in which outputs of all of said light-receiving elements of said first photoelectric conversion units can be utilized for obtaining a focus detection result to be used for focus control, and a second mode of operation in which outputs of only part of said light-receiving elements of said first photoelectric conversion unit can be utilized for obtaining the focus detection result;

a selector to select between said first and second modes of operation in accordance with the detected attitude of the camera; and

a lens driving unit to drive and focus a photographic lens according to the focus detection result obtained by said focus detector.

7. An autofocus camera according to claim 6, wherein said first photoelectric conversion unit is horizontally oriented and said second photoelectric conversion unit is

vertically oriented when the camera is in a horizontal attitude.

8. An autofocus camera according to claim **1**, wherein at least one of said first and second photoelectric conversion units includes a plurality of light-receiving elements, and wherein said focus detector has a first mode of operation in which outputs of all of said light-receiving elements can be utilized for obtaining said focus detection result when said attitude detector detects a first camera attitude, and a second mode of operation in which outputs of only part of said light-receiving elements can be utilized for obtaining said focus detection result when said attitude detector detects a second camera attitude.

9. An autofocus camera according to claim **6**, wherein said second photoelectric conversion unit includes a plurality of light-receiving elements, and outputs of at least part of the light-receiving elements of said second photoelectric conversion unit can be utilized for obtaining the photodetection result in each of said first and second modes of operation.

10. A method of detecting focus in an autofocus camera, comprising the steps of:

detecting attitude of the camera;

selecting one of a first photoelectric conversion unit and a second photoelectric conversion unit in accordance with a detected attitude of the camera, said first photoelectric conversion unit receiving subject light from a detecting region extended in one direction of a photographic image plane and performing photoelectric conversion, and said second photoelectric conversion unit receiving subject light from a detecting region extended in a direction different from said one direction of said photographic image plane and performing photoelectric conversion;

conducting a first focus detection operation using the selected photoelectric conversion unit;

discriminating based on a result of the focus detection operation whether focus can be detected using the selected photoelectric conversion unit, and, if it is discriminated that focus cannot be detected using the selected photoelectric conversion unit, conducting a second focus detection operation using the other of said first and second photoelectric conversion units; and

driving and focusing a photographic lens in accordance with a focus detection result from the first focus detection operation or the second focus detection operation depending upon whether or not the second focus detection operation is conducted.

11. A method of detecting focus in an autofocus camera, comprising the steps of:

detecting attitude of the camera;

if a first camera attitude is detected, conducting a focus detection operation using outputs of all light-receiving elements of a plurality of light-receiving elements receiving subject light from detecting regions extended in one direction of a photographic image plane to obtain a focus detection result to be used for focus control;

if a second camera attitude is detected, conducting a focus detection operation using only part of said light-receiving elements to obtain the focus detection result; and

driving and focusing a photographic lens in accordance with the focus detection result.

* * * * *

US005687408A

United States Patent [19]

Park

[11] Patent Number: 5,687,408

[45] Date of Patent: Nov. 11, 1997

[54] **CAMERA AND METHOD FOR DISPLAYING PICTURE COMPOSITION POINT GUIDES**

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[73] Assignee: **Samsung Aerospace Industries, Ltd.**, Kyongsangnam-do, Rep. of Korea

[21] Appl. No.: **675,477**

[22] Filed: **Jul. 3, 1996**

[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**[6] **G03B 1/00**; G03B 17/20

[52] **U.S. Cl.** **396/271**; 396/287; 396/296; 396/404; 396/405

[58] **Field of Search** 396/287, 296, 396/121, 122, 123, 147, 404, 405, 271

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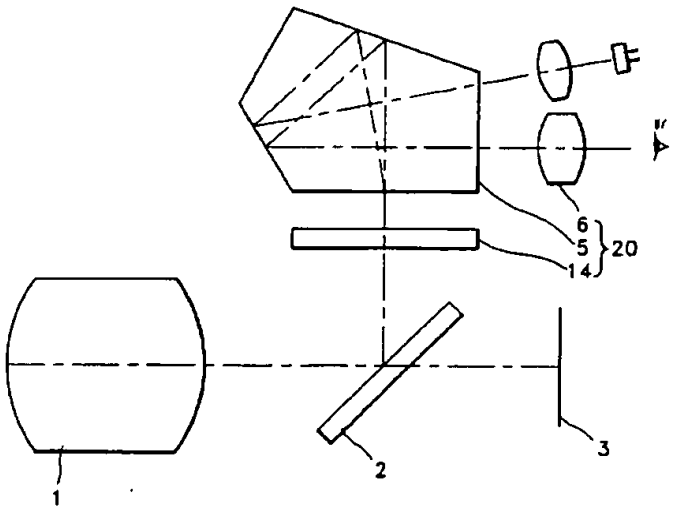
Primary Examiner—W. B. Perkey

Attorney, Agent, or Firm—Finnegan, Henderson, Farabow, Garrett & Dunner, L.L.P.

[57] **ABSTRACT**

A camera and method are disclosed which provide a photographer with a picture composition guide that may be viewed through the viewfinder. Standard composition points corresponding to golden section points are displayed for the photographer to see. LCD's or LED's are used to display the composition points, and an external display portion allows the photographer to check a display state of the standard composition points.

18 Claims, 8 Drawing Sheets



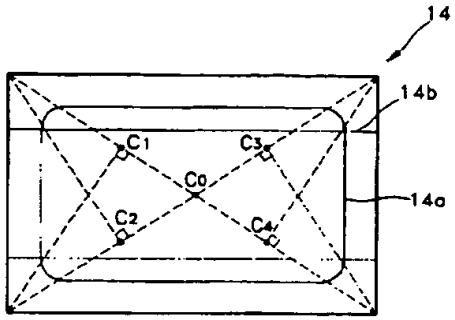


FIG.1 (PRIOR ART)

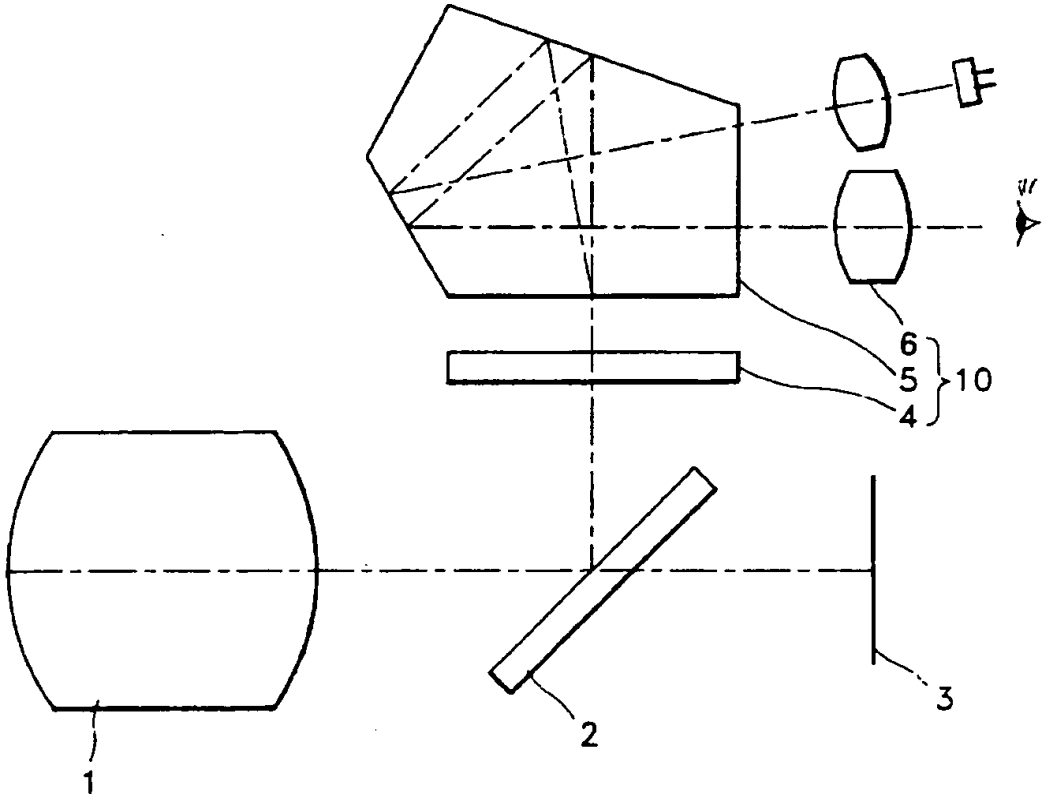


FIG.2 (PRIOR ART)

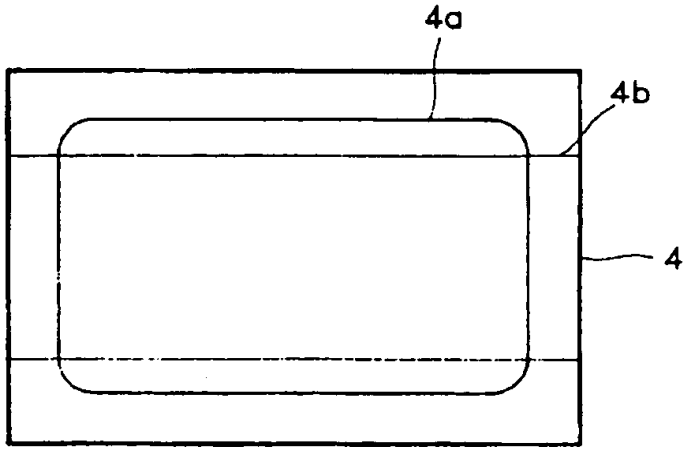


FIG.3

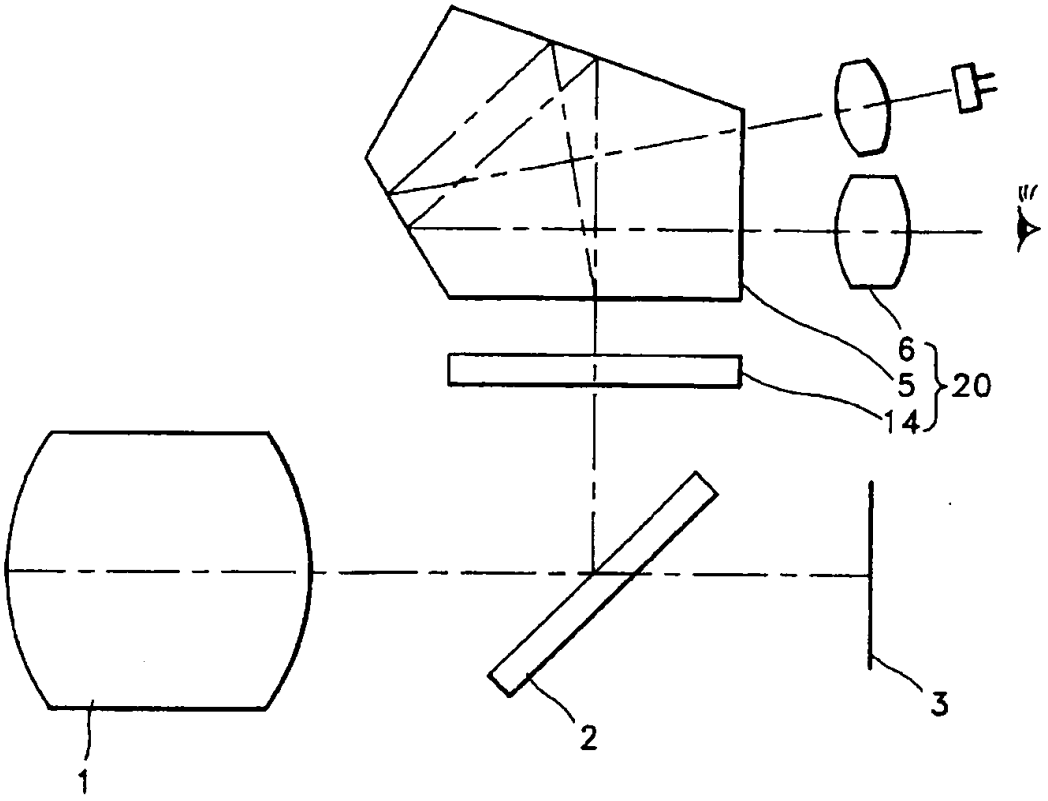


FIG.5

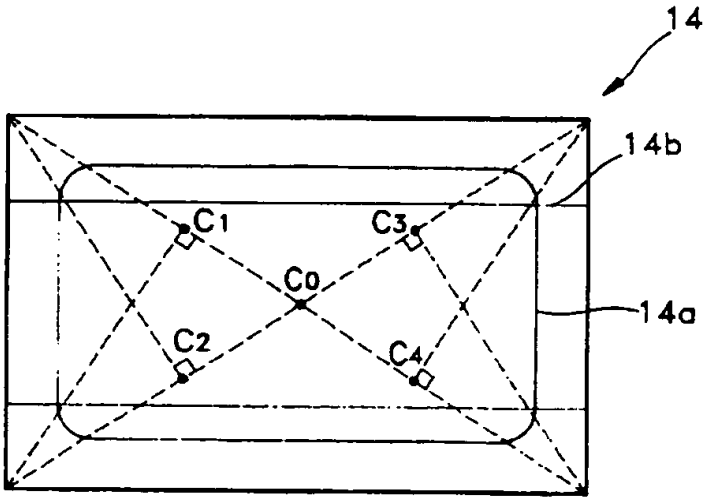


FIG.4

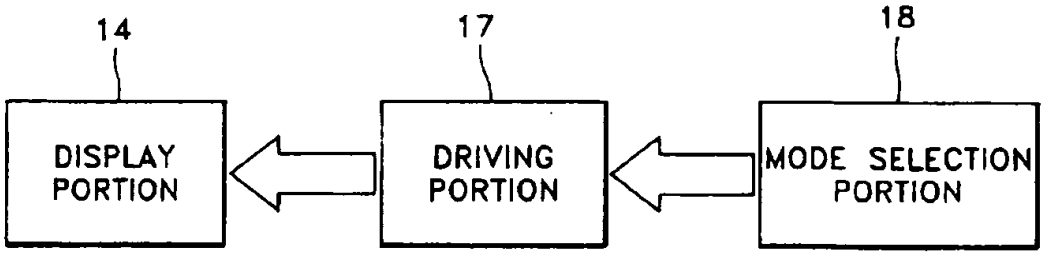

14
17
18
DISPLAY PORTION
DRIVING PORTION
MODE SELECTION PORTION

FIG.7

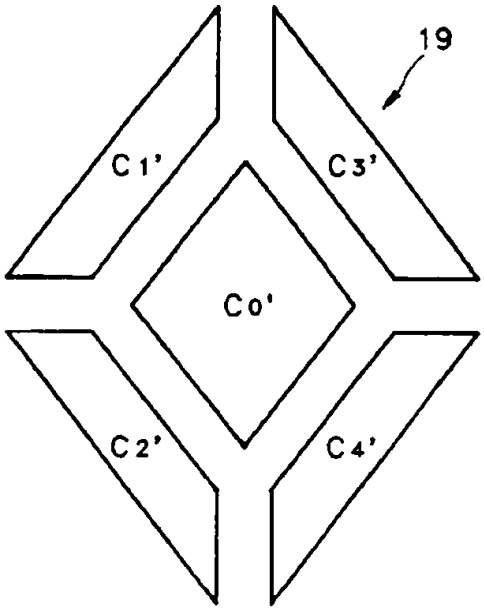

19
C1'
C3'
Co'
C2'
C4'

FIG.6

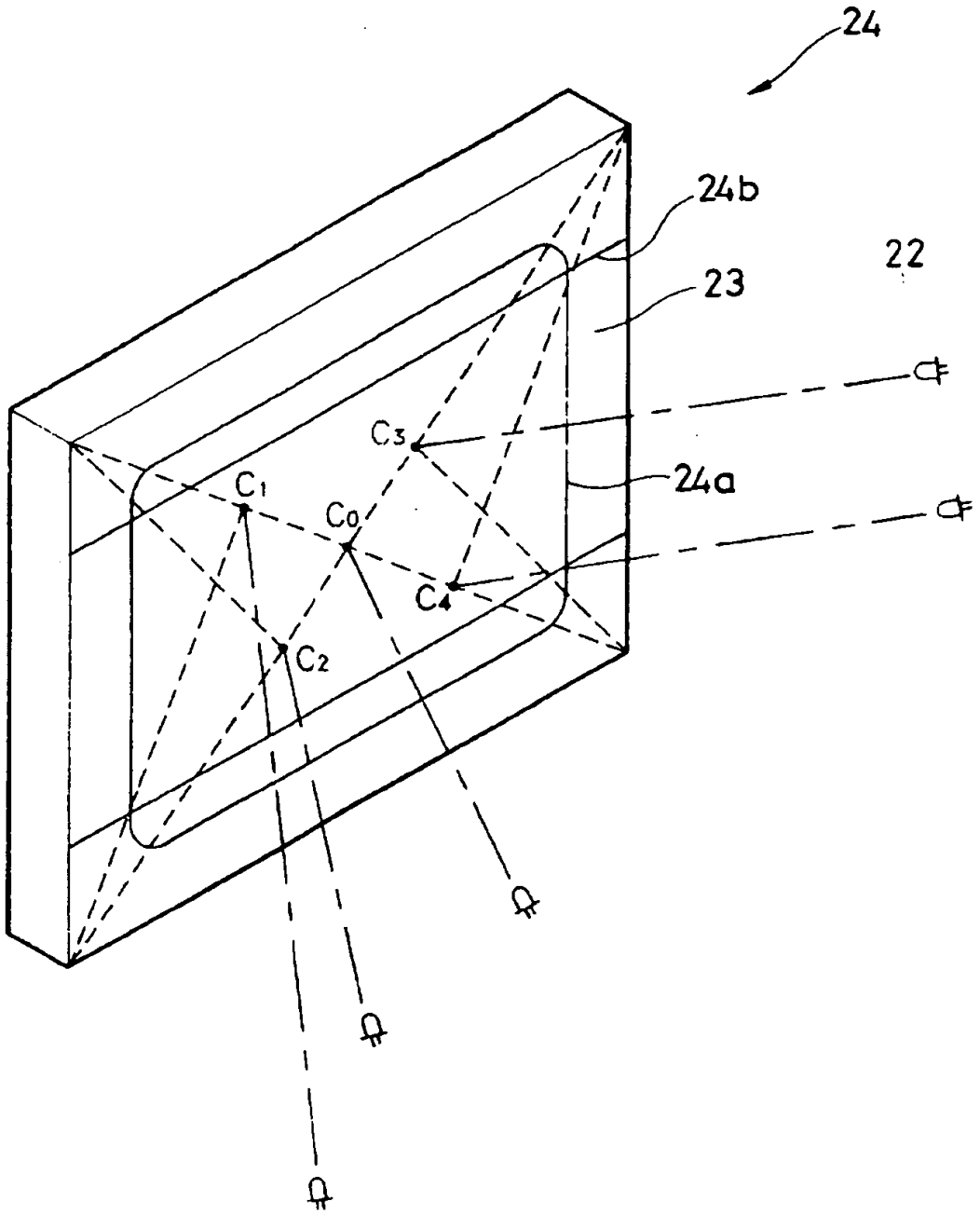


FIG.8

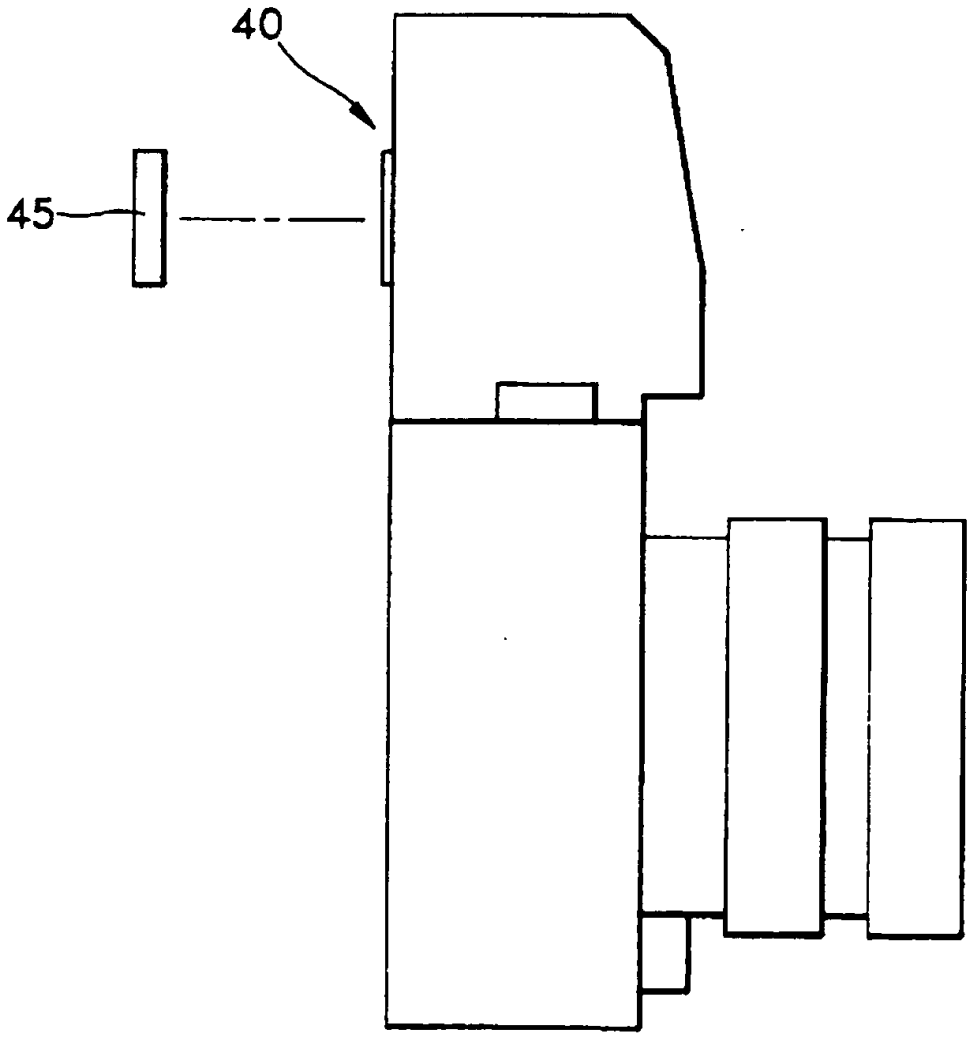


FIG.9

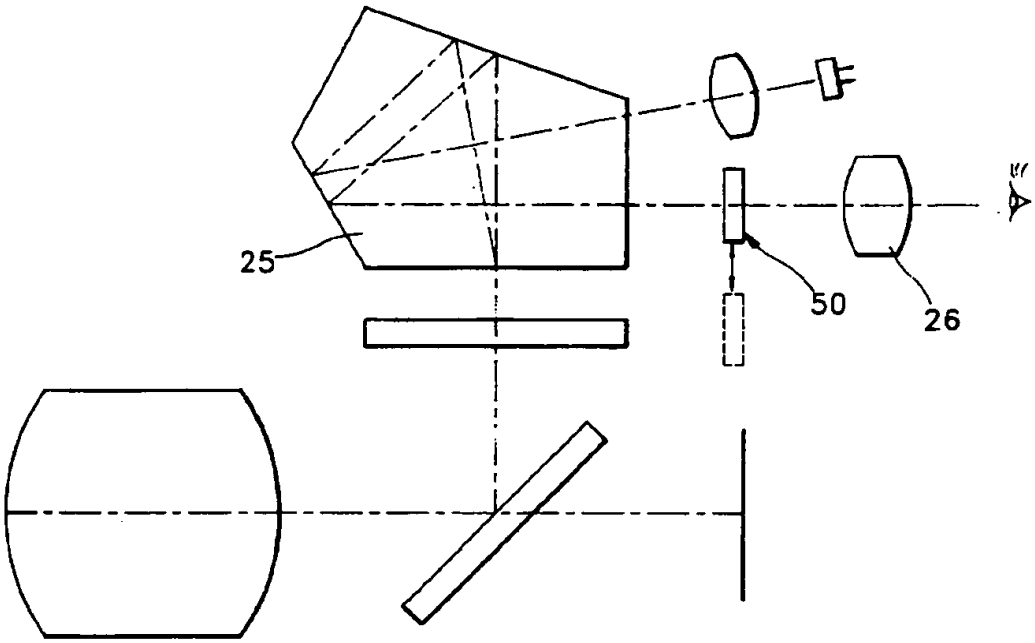


FIG.10

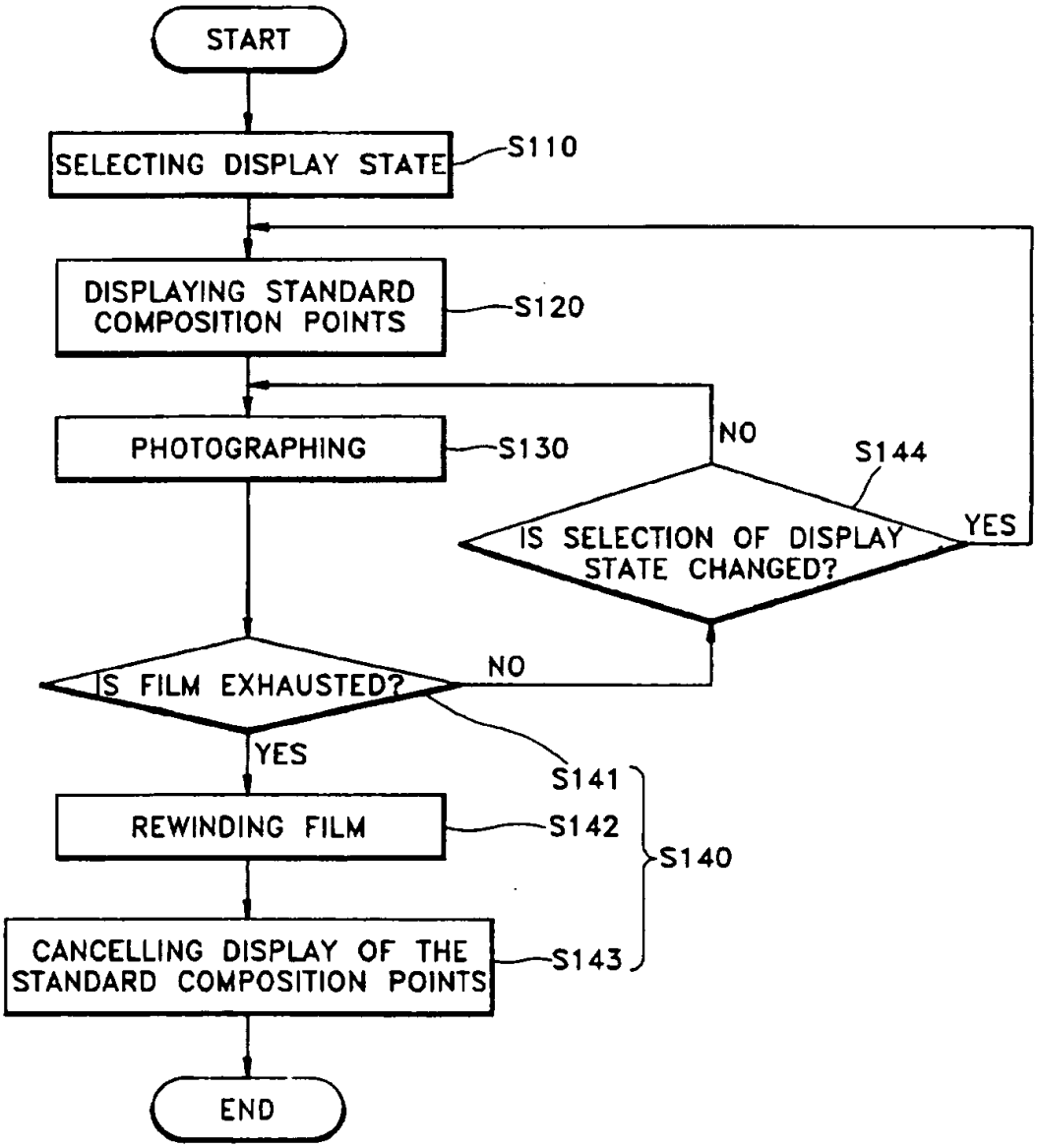
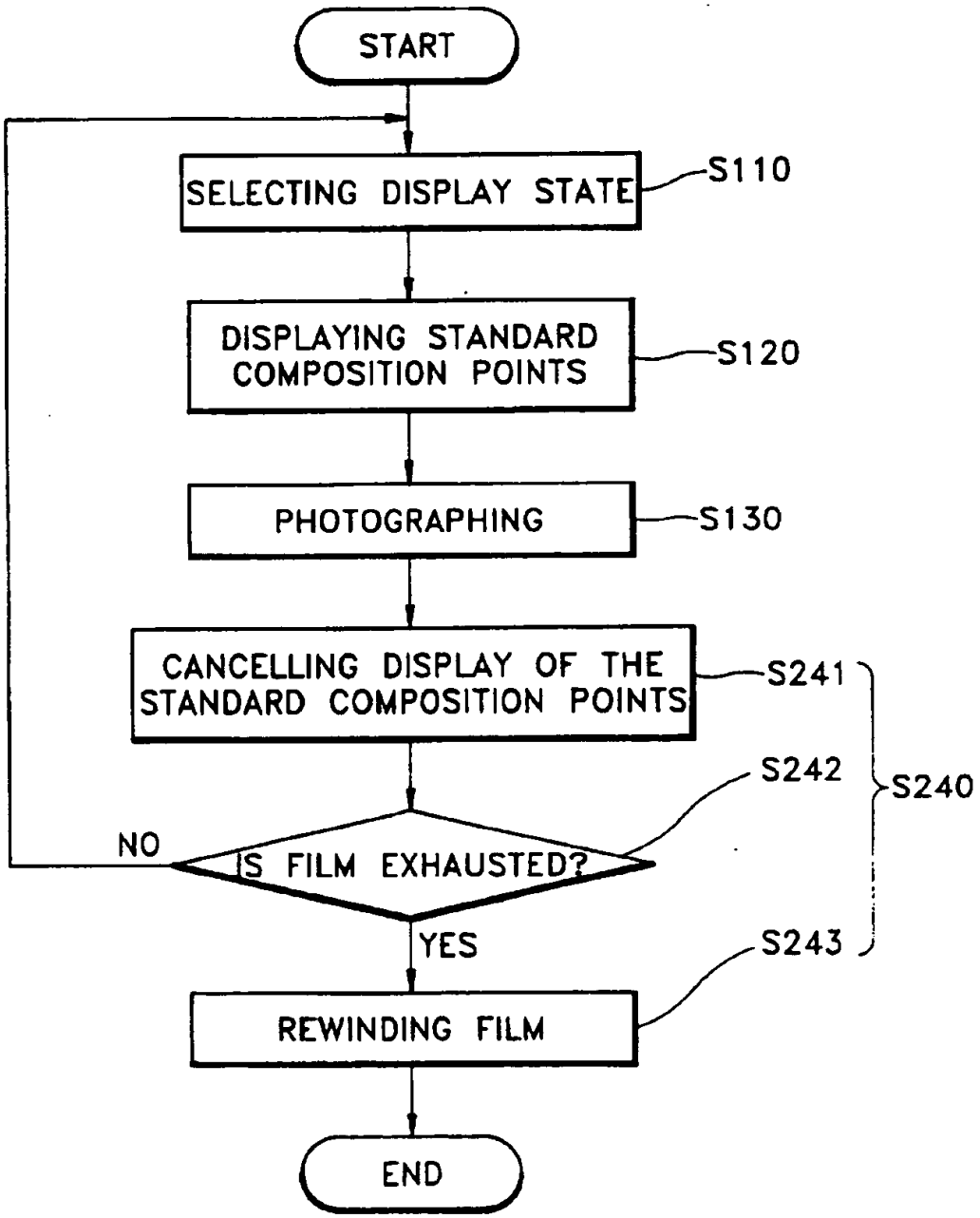

START
SELECTING DISPLAY STATE
S110
DISPLAYING STANDARD COMPOSITION POINTS
S120
PHOTOGRAPHING
S130
NO
S144
IS SELECTION OF DISPLAY STATE CHANGED?
YES
S FILM EXHAUSTED?
NO
YES
S141
REWINDING FILM
S142
S140
CANCELLING DISPLAY OF THE STANDARD COMPOSITION POINTS
S143
END

FIG. 11


START
SELECTING DISPLAY STATE
S110
DISPLAYING STANDARD COMPOSITION POINTS
S120
PHOTOGRAPHING
S130
CANCELLING DISPLAY OF THE STANDARD COMPOSITION POINTS
S241
S242
S240
NO
IS FILM EXHAUSTED?
YES
S243
REWINDING FILM
END

CAMERA AND METHOD FOR DISPLAYING PICTURE COMPOSITION POINT GUIDES

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a camera having a picture composition adjustment function and a method of displaying standard composition points to serve as a photo composition guide to a user. More particularly, the standard composition points may be viewed through the camera's viewfinder to help a user properly arrange the photograph subject within the picture frame.

2. Description of the Related Art

FIG. 1 illustrates the structure of a conventional camera, which includes an object lens 1, a main mirror 2, and a viewfinder 10. The object lens 1 converges the image of a subject (not shown) inside the camera. The main mirror 2 reflects the image of the subject to the viewfinder 10. When a shutter (not shown) is released, main mirror 2 assumes a horizontal state so that the image of the subject is focused on a photosensitive portion 3.

The viewfinder 10 comprises a transmission liquid crystal display (LCD) 4, a penta-prism 5, and an eye lens 6. The penta-prism 5 is a pentagonal prism which twice reflects the image of the subject to the eye lens 6, enabling a user to see an erect or upright real image of the subject. The image of the subject seen by the user through the eye lens 6 corresponds to the image focused on the photosensitive portion 3.

FIG. 2 is a plan view of the transmission LCD 4 installed between the main mirror 2 and the penta-prism 5 shown in FIG. 1. Referring to FIG. 2, a visual field frame *4a* indicating a photographicable area and a guide line *4b* indicating a panorama photographing section are displayed on the transmission LCD 4.

In the conventional camera, it is possible to control the photographing area and image size using the visual field frame *4a* and guide line *4b*. However, it is hard to precisely orient the subject of a photograph according to standard composition conventions, because the conventional camera does not have any such guide within visual field frame *4a*.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a camera that permits adjustment of picture composition by overlaying standard composition points within the visual field frame. Preferably the standard composition points correspond to golden section points of the field frame. Such composition points easily guide a user to proper photograph composition.

To achieve this object, there is provided a camera having an object lens, a main mirror, a penta-prism, an eye lens, a photosensitive portion, and a display device. The display device includes a rectangular display surface located in the main light path, the display surface having a central composition point C_0 located of a central junction of diagonals of the display surface, and four surrounding composition points C_1, C_2, C_3, and C_4 located at junctions between said diagonals and four lines, each line passing through one corner point of the rectangular display surface, and each line being perpendicular to one of the diagonals.

It is another object of the present invention to provide a method for displaying standard composition points for a user to view through the camera's viewfinder.

To achieve this object, there is provided a method of displaying standard composition points in a camera having a picture composition adjustment function. The method includes the steps of selecting between an initial and a user selected display state, and displaying standard composition points corresponding to the selected state. After a photograph is taken, the display is reset to the initial state.

The above objects and advantages of the present invention will become more apparent by the following detailed description of the preferred embodiments, with reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate preferred embodiments of the invention, and together with the general description of the invention given above, and the detailed description of the preferred embodiments given below, serve to explain the principles of the invention.

FIG. 1 is a schematic diagram generally illustrating the optical construction of a conventional camera;

FIG. 2 is a front view of a liquid crystal display in the conventional camera of FIG. 1;

FIG. 3 is a schematic diagram illustrating the optical construction of a camera in accordance with a first embodiment of the present invention;

FIG. 4 is a block diagram illustrating the display device of the camera shown in FIG. 3;

FIG. 5 is a front view of a display portion of the display device of FIG. 4;

FIG. 6 is a schematic perspective view illustrating another embodiment of the display device of FIG. 4;

FIG. 7 is a schematic view illustrating an external display for the camera depicted in FIG. 3;

FIG. 8 is a side view of a camera in accordance with another embodiment of the present invention;

FIG. 9 is a schematic diagram illustrating the optical construction of a camera in accordance with yet another embodiment of the present invention;

FIG. 10 is a flow chart illustrating a method of displaying standard composition points according to the present invention; and

FIG. 11 is a flow chart illustrating another embodiment of a method of displaying standard composition points according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A first embodiment of a camera with an adjustable picture composition function is illustrated in FIG. 3 to FIG. 5. To the extent the first embodiment contains elements similar to those of the conventional camera previously discussed and illustrated in FIG. 1, the same reference numerals are used.

In accordance with the invention, there is provided a display device having a rectangular display surface and a series of composition points thereon. As embodied herein, the display device includes a display portion 14 on which standard composition points C_0, C_1, C_2, C_3, and C_4 are displayed. The display portion 14 is located between a main mirror 2 and a penta-prism 5. A driving portion 17 selectively applies power to the display portion 14, and a mode selection portion 18 transmits signals controlling the display of the standard composition points C_0–N_4 to the driving portion 17 according to a user's selection.

The mode selection portion 18 is provided to enable a user to control the display of standard composition points C_0–C_4.

Mode selection portion **18** preferably has a structure which is easy to manipulate, and may be located on the exterior of the camera.

The display portion **14** is formed of a rectangular transmission LCD and selectively displays the standard composition points C_0–C_4. Preferably, the standard composition points C_0–C_4 correspond to golden section points of the rectangular display portion **14**. Namely, the golden section points include a central point located at a junction C_0 of two diagonal lines of the rectangular display portion **14**, and four surrounding points located at junctions C_1, C_2, C_3, and C_4 of each diagonal line and perpendicular lines extending from four apexes or corners of the rectangular display portion **14**. The standard composition points C_0–C_4 can be selectively displayed on the display portion **14**. This permits a user to take a photograph of a subject following principles of good composition by aligning the subject within composition points C_0–C_4.

A visual field frame **14***a* indicating a photographicable area and a guide line **14***b* indicating a panorama photographing section are preferably printed on the display portion **14**.

The display portion may alternatively be constructed as illustrated in FIG. **6**. In this alternative embodiment, display portion **24** includes plural light sources **22** which are selectively turned on and off. These light sources are preferably light emitting diodes (LED's). The display portion **24** also includes display surface **23** on which are located five standard composition points C_0, C_1, C_2, C_3, and C_4 corresponding to the golden section points of the rectangular display. These standard composition points C_0–C_4 are selectively displayed by the light irradiated from the light sources **22** to each point on the display surface **23**. A visual field frame **24***a* and a guide line **24***b* are further preferably printed on the display surface **23**.

In the camera according to the present embodiment, a display state of the respective standard composition points C_0–C_4 remain as selected, unless the film loaded into the camera is exhausted or an alternative display state is selected by a user. Also, the display of the standard composition points C_0–C_4 can be reset whenever each photograph is taken. The user can preferably select at will between the display states described above.

The display device of the invention may also include an external display **19** as illustrated in FIG. **7**. The external display **19** permits a user viewing the exterior of the camera to check the display state of the standard composition points C_0–C_4 on the display portion (**14** in FIG. **5** and **24** in FIG. **6**). The external display **19** is formed of an LCD or LED and comprises five portions C_0', C_1', C_2', C_3', and C_4' which correspond to the standard composition points C_0, C_1, C_2, C_3, and C_4, respectively.

The user can determine the display state of the standard composition points C_0–C_4 displayed inside the camera by observing the external display **19** since, for example, once the standard composition points C_0 and C_4 are displayed on the display portion **14** (FIG. **5**) inside the camera, the corresponding portions C_0' and C_1' of the external display **19** are simultaneously displayed.

FIG. **8** discloses an alternate embodiment of the invention, including a display device **45** releasably integrated with the exterior portion of the camera's viewfinder **40**. The display device **45** is formed of transparent materials such as glass and plastic, and the standard composition points (not shown) corresponding to the golden section points are displayed thereon, as shown in FIGS. **5** and **6**. The standard composition points, like the visual field frame (not shown) and the guide line (not shown), can be printed on the surfaces of the transparent materials. The user is provided with this guide to good composition after connecting the display device **45** to the viewfinder **40** of the camera.

FIG. **9** illustrates yet another embodiment of the invention, including a display device having a display portion **50** which is switchably installed in the main light path, preferably between penta-prism **25** and eye lens **26**. A switch button (not shown) controls the display portion **50**. The standard composition points (not shown) which correspond to the golden section points are displayed on the display portion **50**, and the display portion **50** can be moved into and out of the main light path by manipulating the external switch button.

A method of displaying the standard composition points C_0–C_4 in a camera according to the present invention is explained in detail, referring to FIG. **10**. According to the selection of the display state of the standard composition points in step **110**, the respective standard composition points are displayed on the display portion **14** (FIG. **5**) in step **120**. The subject is then photographed in step **S130** using the composition points as a guide. Following the photographing step, the display state is initialized in step **S140**. This step includes the substep of checking film exhaustion in step **S141**. If the film is exhausted, it is automatically rewound in substep **S142** and the standard composition points are cancelled from the display in substep **S143**. If the film is not exhausted, it is determined whether the selection of the display state of the standard composition points is changed. (substep **S144**). At this time, if the selection of the display state is not changed, photographing is resumed (step **S130**). If the selection of the display state is changed, the above steps are performed again by returning to step **S120** of the sequence and displaying the standard composition points.

Step **S120** may further include displaying the display state of the standard composition points selected by the user on the external display **19** (FIG. **7**) installed outside the camera.

FIG. **11** is a flow chart showing another embodiment of the method of displaying the standard composition points according to the present invention. Here, the same reference numerals as those of FIG. **10** indicate the same steps.

Substep **S241** of step **S240** initializes the display state, cancelling display of the standard composition points (step **S241**) after photographing occurs in step **S130**. After cancelling the display state, it is determined whether the film is exhausted (substep **S242**). If the film is not exhausted, the sequence returns to initial step **S110** where the display state of the standard composition points is newly selected. If the film is exhausted, the film is automatically rewound (substep **S243**) and the sequence terminates.

As described above, a camera having a picture composition adjustment function according to the present invention provides the user with a selectable composition guide when looking through the camera's viewfinder. As discussed, this guide may be located either inside or outside the camera.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the invention, as claimed.

What is claimed is:

1. A camera, comprising:

an internal main light path having a first end and a second end;

an object lens located at the first end of the main light path for receiving and transmitting light from a subject, thereby forming a subject image;

a main mirror located in the main light path for receiving and reflecting the subject image;

a penta-prism located in the main light path for receiving the subject image reflected by the main mirror and for further twice reflecting the subject image to form an upright real image of the subject;

an eye lens located at the second end of the main light path, and oriented in a manner permitting a user to view the upright real image;

a photosensitive portion located outside of the main light path on a side of the mirror opposite the main light path, the photosensitive portion being arranged to receive the subject image when the subject image is permitted to pass beyond the main mirror; and

a display device having a rectangular display surface located in the main light path, the display surface having a central composition point C_0 located at a central junction of diagonals of the display surface, and four surrounding composition points C_1, C_2, C_3, and C_4 located at junctions between said diagonals and four lines, each line passing through one corner point of the rectangular display surface, and each line being perpendicular to one of the diagonals.

2. A camera as claimed in claim 1, wherein said display surface is part of a display portion on which said standard composition points are selectively displayed, and wherein the camera further includes a driving portion for applying power to said display portion, and a mode selection portion for controlling a display of said standard composition points according to a user's selection.

3. A camera as claimed in claim 2, wherein said display portion is a transmission liquid crystal display located between said main mirror and said penta-prism.

4. A camera as claimed in claim 3, further including means for resetting the display of standard composition points displayed on said display portion after each photograph is taken.

5. A camera as claimed in claim 3, further including means for maintaining said standard composition points in a selected state unless a selection of the display state is changed by a user.

6. A camera as claimed in claim 2, wherein said display portion includes a plurality of selectively activatable light sources, said light sources arranged to irradiate said display portion and thereby display said standard composition points.

7. A camera as claimed in claim 6, wherein said light sources are light-emitting diodes.

8. A camera as claimed in claim 6, further including means for resetting the display of standard composition points displayed on said display portion after each photograph is taken.

9. A camera as claimed in claim 6, further including means for maintaining said standard composition points in a selected state unless a selection of the display state is changed by a user.

10. A camera as claimed in claim 2, wherein said display device further includes an external display permitting a user to check a display state of said standard composition points by viewing an exterior portion of the camera.

11. A camera as claimed in claim 10, wherein said external display is a liquid crystal display having five display portions corresponding to said respective standard composition points.

12. A camera as claimed in claim 1, wherein said display device includes a transparent material portion releasably located on an exterior of said camera.

13. A camera as claimed in claim 1, wherein said display surface is located on a display portion of the display device, the display portion being installed inside said camera in a manner permitting the display portion to be switched between an operative state and an inoperative state, the camera further including a switch button accessible from an exterior portion of said camera to switch said display portion between said operative and inoperative states.

14. A camera as claimed in claim 13, wherein said display portion is arranged in the main light path between said penta-prism and said eye lens.

15. A method of displaying on a display portion of a display device of a camera standard composition points for enabling a user to adjust picture composition, the display device including a driving portion for applying power supply to said portion, and a mode selection portion for controlling a display of said standard composition points between an initial state and a user selected state, the method comprising the steps of:

selecting a display state of said standard composition points;

displaying on said display portion said standard composition points corresponding to said selected state;

photographing a subject; and

resetting the display state of said standard composition points to the initial state,

wherein said step of resetting includes the substeps of:

checking whether film is exhausted;

automatically rewinding the film and canceling the display state of said standard composition points if the film is exhausted;

checking whether the selection of the display state of said standard composition points differs from the initial state when the film is not exhausted; and

resetting the display portion to the initial state when the film is not exhausted.

16. A method of displaying standard composition points on a display portion of a display device in a camera, the composition points for providing a picture composition guide to a user, the display device including a driving portion for applying power to said display portion, a mode selection portion for controlling a display of said standard composition points between an initial state and a user selected state, and an external display for indicating a display state of said standard composition points in accordance with signals transmitted thereto from said mode selection portion, the method comprising the steps of:

selecting a display state of said standard composition points;

displaying on said display portion said standard composition points corresponding to said selected state;

displaying a representation of said standard composition points of said selected state on said external display;

photographing a subject; and

resetting the display state to said initial state.

17. The method as claimed in claim 16, wherein said step of resetting includes the substeps of checking whether film is exhausted, automatically rewinding the film and cancelling the display state of said standard composition points if the film is exhausted, checking whether the selection of the display state of said standard composition points differs from the initial state when the film is not exhausted, and resetting the display portion to the initial state when the film is not exhausted.

18. The method as claimed in claim 16, wherein said step of resetting the display state includes cancelling a current display state, checking whether film is exhausted, resetting the display portion to the initial state when the film is not exhausted, and automatically rewinding the film when the film is exhausted.

* * * * *

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Ferrada Suarez

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[45] Date of Patent: Feb. 16, 1999

[54] **PICTURE COMPOSITION GUIDANCE SYSTEM**

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[73] Assignees: **Sony Corporation**, Japan; **Sony Electronics, Inc.**, Park Ridge, N.J.

[21] Appl. No.: **958,976**

[22] Filed: **Oct. 28, 1997**

[51] **Int. Cl.**[6] **G03B 13/02**; G03B 17/20

[52] **U.S. Cl.** **396/296**; 396/374; 348/334

[58] **Field of Search** 396/147, 296, 396/373, 378, 374; 348/333, 334

[56] **References Cited**

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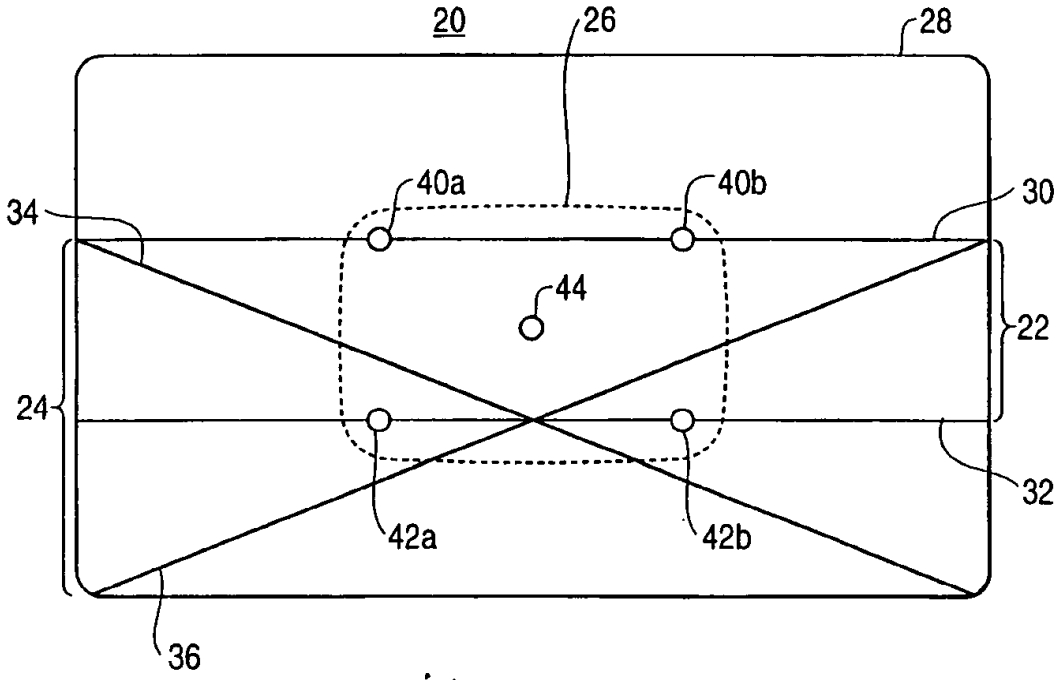
Primary Examiner—William Perkey

Attorney, Agent, or Firm—Ronald P. Kananen

[57] **ABSTRACT**

A picture composition guidance system for guiding a user to take pictures with quality picture compositions includes a horizon guide having an upper horizontal line and a lower horizontal line, a diagonal guide having a pair of diagonal lines, and a strong points guide having a pair of upper markers, a pair of lower markers, and a center marker. The horizon guide, the diagonal guide, and the strong points guide are superimposed on a viewfinder for a camera such that the upper horizontal line and the lower horizontal line demarcate the view finder substantially in thirds. Further, the pair of diagonal lines intersect on the lower horizontal line while the pair of upper markers are positioned on the upper horizontal line, the pair of lower markers are positioned on the lower horizontal line, and the center marker is positioned substantially in the center of the viewfinder. One embodiment of the invention further includes a toggle feature allowing a user to customize which one of the guides are displayed on the viewfinder.

15 Claims, 4 Drawing Sheets



Vehicles

FIG. 1
(PRIOR ART)

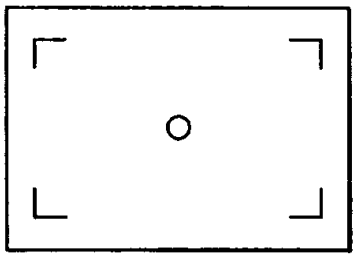


FIG. 2

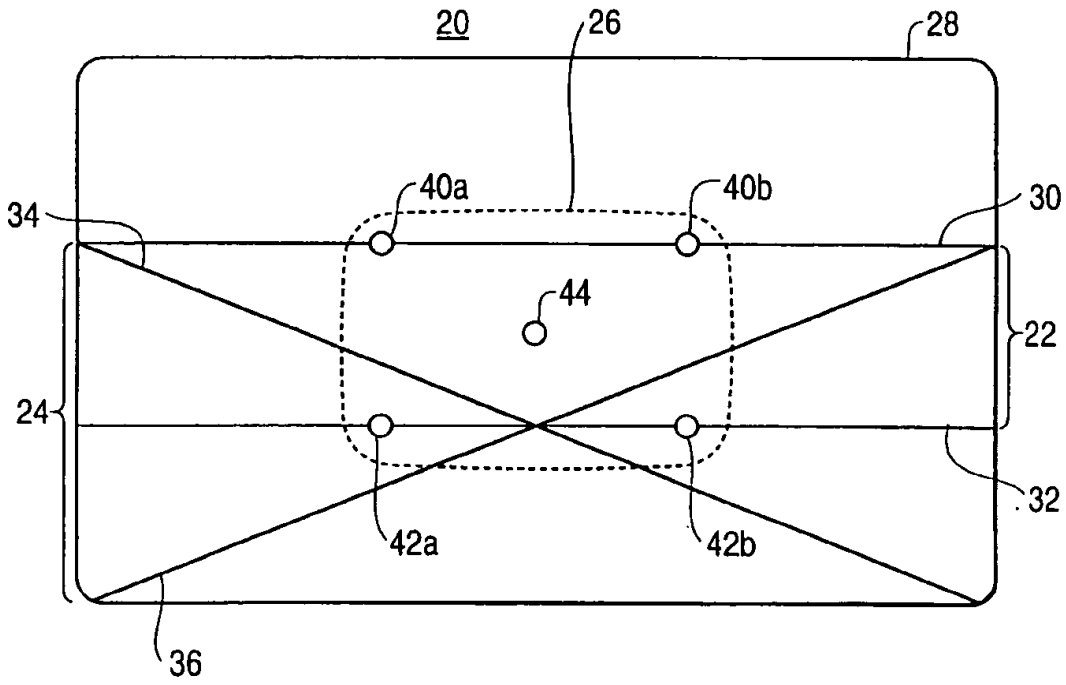
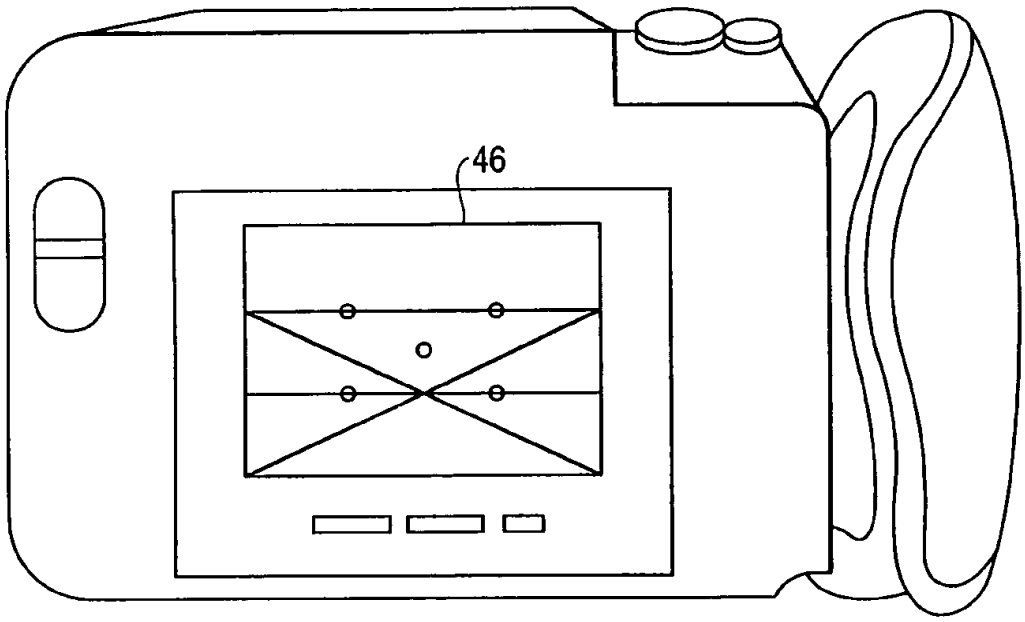


FIG. 3



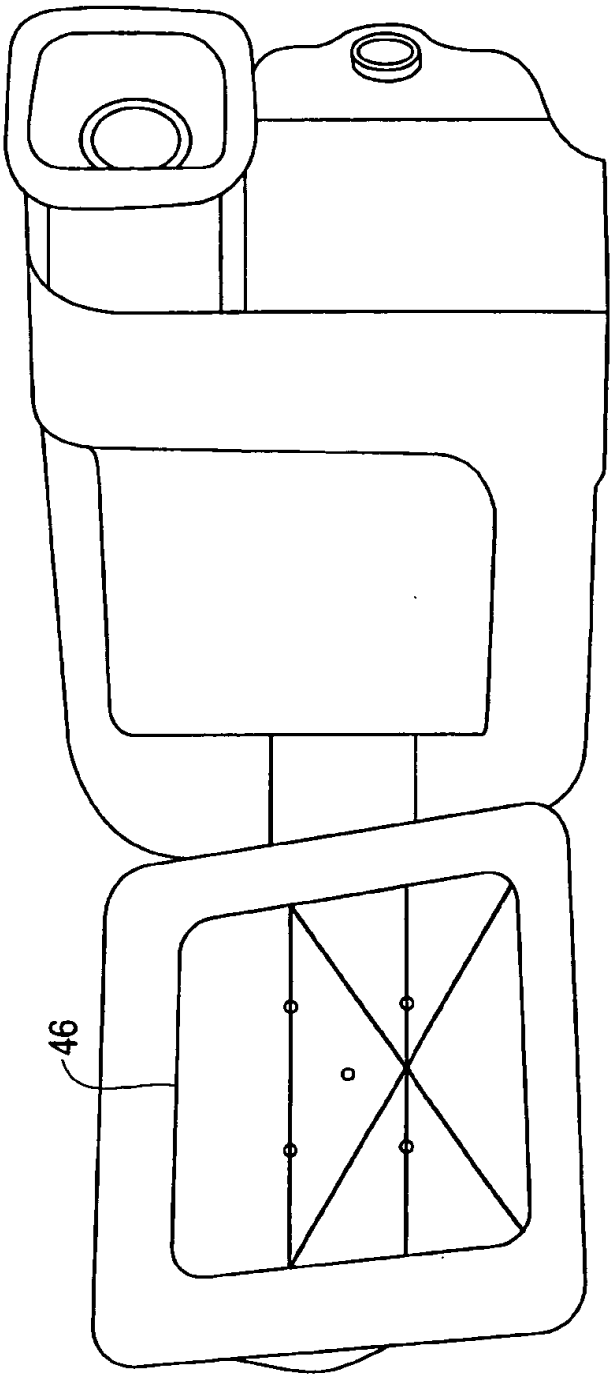


FIG. 4

FIG. 5

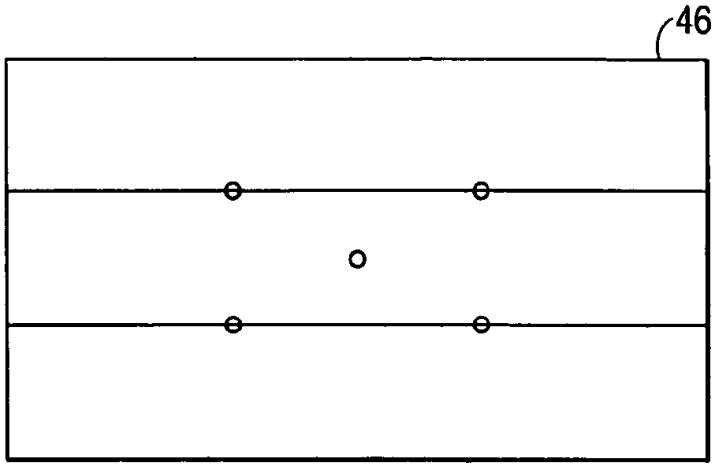
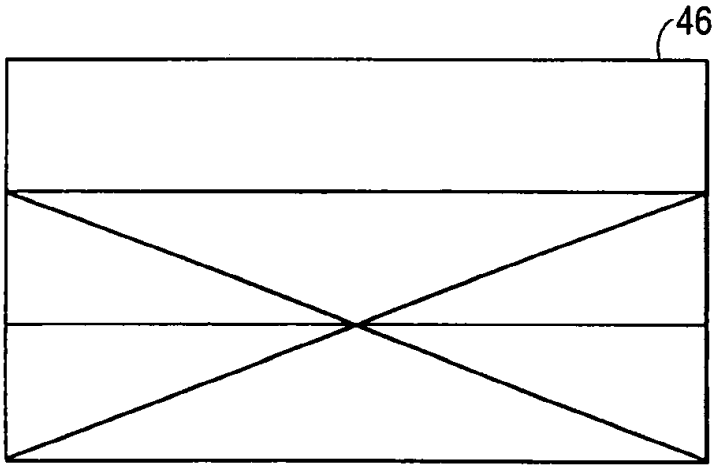


FIG. 6



PICTURE COMPOSITION GUIDANCE SYSTEM

FIELD OF THE INVENTION

The present invention relates to picture compositions of recorded pictures. In particular, the present invention is directed to a guide for picture composition in recording pictures using a camera, such as a video camera, for example.

BACKGROUND OF THE INVENTION

Cameras of all types are becoming more and more affordable to consumers as technologies for manufacturing cameras have become more efficient and cost effective. Consequently, many consumers are purchasing and using cameras to take photographic pictures, video recordings, and even digitized pictures. Many amateur photographers or videographers make mistakes when taking pictures or making video recordings which can only be avoided by taking photography or videography courses. One such area of common mistake is in the area of picture composition.

Because people have an affinity for symmetry, amateur photographers or videographers tend to align a subject in the center of a picture or video recording at all times, creating bland or sometimes disastrous picture composition. These amateurish mistakes are further reinforced by cameras currently in use. As shown in FIG. **1**, viewfinders of most cameras only have a circle or a cross-hair in the center of a viewfinder with maybe brackets on the outer edges to delimit the size of pictures or screens on which the picture would be transferred. Almost instinctively, users align the subject of the picture to the circle or cross-hair in the center of the viewfinder. Even those users who are taking or have taken picture composition courses sometimes do not understand the concept of horizons, diagonals, and strong points, for example, or forget the lessons learned from lack of frequently practice. What is needed is a user-friendly guidance system that would aid a camera user in taking pictures with quality picture compositions.

SUMMARY OF THE INVENTION

The present invention is directed to a picture composition guidance system for camera users in taking pictures. In particular, the picture composition guidance system of the present invention comprises a horizon guide including an upper horizontal line and a lower horizontal line, a diagonal guide including a pair of diagonal lines, and a strong points guide including a pair of upper markers, a pair of lower markers, and a center marker. The horizon guide, the diagonal guide, and the strong points guide are superimposed on the view finder such that the upper horizontal line and the lower horizontal line of the horizon guide demarcate the view finder substantially in thirds. Further, the pair of diagonal lines of the diagonal guide intersect on the lower horizontal line. Still further, the pair of upper markers are positioned on the upper horizontal line, the pair of lower markers are positioned on the lower horizontal line, and the center marker is positioned substantially in the center of the viewfinder.

In one embodiment of the invention, the picture composition guidance system of the present invention includes a toggle feature that allows the user to toggle the guidance system on and off, effectively displaying the guidance system on the viewfinder when need and hiding the guidance system when not needed. Further, the toggle feature of the present invention allows a user to choose which guides should be displayed on the viewfinder at any given time therefore customizing the viewfinder to display only those guides needed by the user.

One advantage of the guidance system of the present invention is that the present invention allows even the novice of camera users to create pictures, whether photographic or video, with quality picture compositions otherwise reserved only for those highly trained in photography or videography.

Another advantage of the guidance system of the present invention is that the present invention may function as reminders to even those who are trained in the photographic or videographic arts when taking pictures.

Yet another advantage of the guidance system of the present invention is that the present invention can be customized to display only the needed guides to those users who might be well versed in one aspect of picture composition while being weak on others.

Yet another advantage of the guidance system of the present invention is that the guides may be incorporated into any camera system whether the camera is photographic, video, or digital.

BRIEF DESCRIPTION OF DRAWINGS

The features and inventive aspects of the present invention will become more apparent upon reading the following detailed description, claims, and drawings, of which the following is a brief description:

FIG. **1** is a view of a viewfinder of the prior art.

FIG. **2** is a plan view of a picture composition guidance system of the present invention.

FIG. **3** is an example of a video recorder employing the picture composition guidance system of the present invention.

FIG. **4** is an example of another video recorder employing the picture composition guidance system of the present invention.

FIGS. **5** and **6** are an example of customization feature of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

FIG. **2** shows a plan view of one embodiment of the present invention. Picture composition guidance system **20** of the present invention includes a horizon guide **22**, a diagonal guide **24**, and a strong points guide **26**. Each of these guides are superimposed on viewfinder **28** of a photographic camera, a video camera, or the like.

Horizon guide **22** includes an upper horizontal line **30** and a lower horizontal line **32**. Lower horizontal line **32** is placed approximately one-third of the way above the bottom of viewfinder **28**. Further, upper horizontal line **30** is placed approximately two-thirds of the way above the bottom of viewfinder **28**. In this way, viewfinder **28** is divided into thirds by upper horizontal line **30** and lower horizontal line **32**. The placement of upper and lower horizontal lines **30** and **32** are critical because horizon guide **22** follows the "rule of thirds" as taught in graphic design and photography. The "rule of thirds" is based on the theory that the human eye naturally looks to a point about two-thirds up a page. In this way, horizon guide **22** aids the user to place horizons of the subject in the appropriate areas of the picture. For example, a user would place the horizon near or on upper

horizontal line **30** to emphasize land or water whereas the horizon would be placed near or on lower horizontal line **32** to emphasize the sky.

Diagonal guide **24** includes diagonal lines **34** and **36** intersecting at approximately one third of the way above the bottom of viewfinder **28**. As usually taught in photography courses, diagonal placement of linear shaped subjects, such as roads, waterways, and fences, for example, are generally perceived to be more dynamic than horizontal placement. Diagonal guide **24** aids a user in placing linear subjects in diagonal perspectives while preventing too much rotation of the subject.

Strong points guide **26** includes a pair of upper markers **40***a* and **40***b*, a pair of lower markers **42***a* and **42***b*, and center marker **44**. Upper markers **40***a* and **40***b* are positioned approximately two-thirds of the way above the bottom of viewfinder **28** and are spaced apart approximately a third of the way longitudinally of viewfinder **28**, thus dividing upper horizontal line **30** approximately in thirds. Similarly, lower markers **42***a* and **42***b* are positioned one-third of the way above the bottom of viewfinder **28** and spaced apart approximately a third of the way longitudinally of viewfinder **28**, thus dividing lower horizontal line **32** approximately in thirds. Center marker **44** is positioned approximately in the center of viewfinder **28**. The purpose of strong points guide **26** is to aid the user in placement of subjects in the picture.

Generally, asymmetric (informal) balance is considered to be more pleasing in a picture than symmetric (formal) balance in photography. Placing the main subject off-center and balancing the offset with another minor object, for example, is usually more effective than merely placing the subject in the center of a picture. Furthermore, giving a moving subject room in the picture projects a sense of dynamic motion. Strong points guide **26** guides a user to place a subject or multiple subjects on or near any of markers **40***a*–**44** based on the principles above.

Viewfinder **28** may be, but not limited to, those of photographic cameras, video cameras, digital cameras, and the like. Guides **22**, **24**, and **26** may be etched into viewfinder **28** similar to most common cameras, but other suitable methods may be used. Particularly most video cameras utilize liquid crystal displays ("LCD") as viewfinders. As shown in FIG. **3**, some models employ large LCD screens that are built into the back casing. On others, as shown in FIG. **4**, a pivoting LCD screen is employed to view the picture being recorded.

According to another embodiment of the present invention, a toggling feature allows a user to superimpose picture composition guide **20** on LCD viewfinder **46**. In particular, the toggling feature allows a user to turn picture composition guide **20** on and off such that picture composition guide **20** appears on LCD screen **46** when invoked by the user and disappears when disabled. Furthermore, the toggling feature allows a user to customize which of guides **22**, **24**, and **26** are displayed at any given time. For example, a user might only need horizon guide **22** and strong points guide **26** for one picture as shown in FIG. **5**, but needs horizon guide **22** and diagonal guide **24** for anther picture as shown in FIG. **6**. In this way, a user can customize which guides are displayed on the viewfinder using the toggling feature to meet different needs.

Having fully described the preferred embodiments of the invention, variations and modifications may be employed without departing from the scope of the present invention. Accordingly, the following claims should be studied to learn the true scope of the present invention.

What is claimed is:

1. A picture composition guidance system usable with a viewfinder of a camera comprising:

a horizon guide including an upper horizontal line and a lower horizontal line, wherein said horizon guide is superimposed on said view finder such that said upper horizontal line and said lower horizontal line demarcate said view finder substantially in equal thirds; and

a diagonal guide including a pair of intersecting diagonal lines, wherein said diagonal guide is superimposed on said viewfinder such that said pair of diagonal lines extend along substantially the longitudinal length of said view finder and intersect on said lower horizontal line at substantially the middle of the longitudinal direction of said lower horizontal line.

2. A picture composition guidance system usable with a viewfinder of a camera comprising:

a diagonal guide including a pair of intersecting diagonal lines, wherein said diagonal guide is superimposed on said viewfinder such that said pair of diagonal lines extend along substantially the longitudinal length of said view finder and said pair of diagonal lines intersect at approximately one third of the way above the bottom of said viewfinder and at substantially the middle of the longitudinal direction of said view finder.

3. A picture composition guidance system usable with a viewfinder of a camera comprising:

a horizon guide including an upper horizontal line and a lower horizontal line;

a diagonal guide including a pair of diagonal lines extending substantially the longitudinal length of said view finder; and

a strong points guide including a pair of upper markers, a pair of lower markers, and a center marker,

wherein said horizon guide, said diagonal guide, and said strong points guide are superimposed on said view finder such that said upper horizontal line and said lower horizontal line demarcate said viewfinder substantially in equal thirds, said pair of diagonal lines intersect on said lower horizontal line at substantially the middle of the longitudinal length of said lower horizontal line, said pair of upper markers are positioned on said upper horizontal line, said pair of lower markers are positioned on said lower horizontal line, and said center marker is positioned substantially in the center of said viewfinder.

4. The guidance system of claim **3**, further comprising a toggle feature for toggling each of said horizontal lines, said diagonal lines, and said markers of said horizon guide, said diagonal guide, and said strong points guide on and off in any combination.

5. The guidance system of claim **3**, wherein said viewfinder is a liquid crystal display.

6. The guidance system of claim **3**, wherein said camera is a photographic camera.

7. The guidance system of claim **3**, wherein said camera is a video camera.

8. The guidance system of claim **3**, wherein said camera is a digital camera.

9. The picture composition guidance system as set forth in claim **2**, further comprising:

a strong points guide for guiding the balance of a picture composition including a pair of upper markers, a pair of lower markers, and a center marker, wherein said upper, lower, and center markers are superimposed on said view finder.

10. The picture composition guidance system as set forth in claim 9, wherein said pair of upper markers are positioned on said upper horizontal line, said pair of lower markers are positioned on said lower horizontal line, and said center marker is positioned substantially in the center of said viewfinder.

11. The guidance system of claim 9, further comprising a toggle feature for toggling each of said diagonal lines and said markers of said diagonal guide and said strong points guide on and off in any combination.

12. The guidance system of claim 2, further comprising a toggle feature for toggling each of said diagonal lines of said diagonal guide on and off in any combination.

13. The guidance system of claim 1, further comprising a toggle feature for toggling each of said horizontal lines and said diagonal lines of said horizon guide and said diagonal guide on and off in any combination.

14. A picture composition guidance system usable with a viewfinder of a camera comprising:

a diagonal guide including a pair of intersecting diagonal lines, wherein said diagonal guide is superimposed on said viewfinder such that said pair of diagonal lines extend along substantially the longitudinal length of said view finder and intersect at substantially one third of the way above the bottom of said view finder; and

a toggle feature for toggling each of said diagonal lines of said diagonal guide on and off in any combination.

15. A picture composition guidance system usable with a viewfinder of a camera comprising:

a horizon guide including an upper horizontal line and a lower horizontal line;

a diagonal guide including a pair of diagonal lines; and

a strong points guide including a pair of upper markers, a pair of lower markers, and a center marker,

wherein said horizon guide, said diagonal guide, and said strong points guide are superimposed on said view finder such that said upper horizontal line and said lower horizontal line demarcate said viewfinder substantially in equal thirds, said pair of diagonal lines intersect on said lower horizontal line, said pair of upper markers are positioned on said upper horizontal line, said pair of lower markers are positioned on said lower horizontal line, and said center marker is positioned substantially in the center of said viewfinder,

said guidance system further including a toggle feature for toggling each of said horizontal lines, said diagonal lines, and said markers of said horizon guide, said diagonal guide, and said strong points guide on and off in any combination.

* * * * *